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A capital approach for assessing local coastal governance

Louis Celliers[1,3,*], Sergio Rosendo[2], Maria Máñez Costa[3], Lenice Ojwang[4], Maria Carmona[3], David Obura[4]

[1]Council for Scientific and Industrial Research, Natural Resources and the Environment, PO Box 17001, Congella, 4013, South Africa. louis.celliers@hzg.de
Climate Service Center Germany – Helmholtz Zentrum Geesthacht, Fischertwiete 1, 20095 Hamburg, Germany
[2]Interdisciplinary Centre of Social Sciences (CICS.NOVA), Faculdade de Ciências Sociais e Humanas (FCSH), Universidade Nova de Lisboa (UNL), Avenida de Berna, 26-C/1069-061 Lisbon, Portugal
[3]Climate Service Center Germany – Helmholtz Zentrum Geesthacht, Fischertwiete 1, 20095 Hamburg, Germany
[4]CORDIO East Africa - 9 Kibaki Flats, Kenyatta Beach, Bamburi Beach, PO Box 10135, Mombasa, 80101, Kenya

*Corresponding author

Abstract
The importance of local government for addressing environmental change, including climate change, was recognized at the 1992 Earth Summit. More so, coastal governance encompasses not only the actions of the state (which includes local governments), but also of other actors such as communities, businesses and civil society organizations. Solutions to improving coastal governance include the implementation of Integrated Coastal Management which also serves as means to plan and achieve climate change adaptation. This paper proposes the establishment of a framework and methodology to assess local coastal governance based on a composite of hierarchical metrics formed by different forms of capital and associated factors and indicators. The application of this methodology resulted in the description of a baseline for local coastal governance. This baseline is useful for informing different functional levels within local government, *e.g.* technical, managerial and political. The baseline consisted of a comprehensive assessment of the different forms of capitals furthered categorized by factors and measured by indicators of local coastal governance. The capitals approach and method for measuring governance is potentially repeatable and can identify progress towards longer-term coastal management and climate adaptation goals as well as areas requiring improvements. Ultimately, it can be developed into a self-assessment tool to help local government to think reflexively about how they are managing the coast and the climate risks impacting on coastal assets and people.

Keywords: Local coastal governance; capital assessment framework; climate change adaptation; integrated coastal management; Western Indian Ocean; South Africa

1 Introduction

The role of local governments in addressing climate change is increasingly acknowledged (Measham et al., 2011; Tribbia and Moser, 2008; Roberts et al., 2012; IPCC, 2014). Local governments have a wide range of planning, regulatory and service provision mandates. Climate change has important implications for the implementation of these mandates, requiring local governments to consider and integrate climate risks and opportunities in their planning. Through their various functions, local governments can play a vital role in driving and facilitating adaptation at the local scale, and therefore complement adaption efforts at national levels. In a coastal context, adapting to climate risks such as rising sea levels and coastal flooding will involve changes in urban planning, improvements in infrastructure and other local-level measures, which often fall within the responsibility of local governments. Moreover, many countries are also developing climate change legislation and national adaptation plans, many of which devolve climate adaptation responsibilities to local government (GLOBE, 2016)

Adaptation to climate change in coastal zones is particularly challenging because of the ecological and socio-economic complexity of coastal systems (Wong et al., 2014). Integrated Coastal Management (ICM) is a widely recognized process to address the multiple pressures on, and dynamics of, coastal zones, including those related to climate change (Bijlsma, 1997; Klein et al., 1999). ICM promotes a strategic and adaptive approach to coastal zone management through coordination amongst policy goals, sectors, actors and planning tools, and public participation and use of scientific knowledge in decision-making. It has also been argued that ICM can create an enabling environment for local government to address climate change (Sales 2009; Tobey et al. 2010; Falaleeva et al. 2011; Measham et al. 2011; Celliers et al. 2013). Tobey et al (2010), for example, suggest that the ICM cycle involving issue identification and assessment, program preparation, formal adoption and funding, implementation and evaluation can provide a roadmap for local adaptation; while Celliers et al (2013) show the legal and policy pathways through which ICM can enable local government action on coastal climate issues.

A growing body of literature has emerged on the enabling conditions and constraints to local governments realizing their potential in climate adaptation (Amundsen et al. 2010; Measham et al. 2011; Reisinger et al. 2011; Baker et al. 2012; Bulkeley and Castán Broto 2013; Pasquini et al. 2015). Constraints include, among others, lack of financial and human resources, lack of expertise and experience to plan and implement adaptation measures, and lack of awareness amongst elected officials and political support for adaptation actions. On the other hand, successful cases of local government driven adaptation planning and action have been shown to be down to, for example, the existence of local climate 'champions' or leaders, partnerships with private sector, non-governmental and community-based organizations, supporting legislation and guidance from the national level. Ultimately, for many local governments, addressing climate change adds to an already extensive and increasing list of demands and responsibilities in a context of overstretched resources (Ojwang et al. 2017; Rosendo et al. 2018).

While some studies have examined the connections between ICM, local government and climate change adaptation (Celliers et al., 2015, 2013), a framework to assess the status and progress of local government in adaptation within the context of ICM has not yet been developed. Local coastal governance baselines are one option to address this gap. Coastal governance in pursuit of

ICM can be assessed and measured (Stojanovic et al., 2004) to define a governance baseline (Olsen et al., 2009). This baseline then provides a reference point against which future changes can be measured and evaluated, thus promoting learning for adaptive management. Assessing governance can also identify strengths and weaknesses in a governance system and evaluate performance over time (Carmona et al., 2017; Máñez et al., 2014).

This paper *develops and tests a framework to assess local coastal governance based on composite hierarchical metrics formed by five forms of "capital"* (social, human, political, financial and environmental)(Goodwin, 2003; Viederman, 1994). This framework is based on a modified Capitals Approach Framework (CAF) proposed by Máñez et al. (2014, see also Carmona et al. 2017). It was adapted to reflect the different elements of the ICM policy cycle as well as key factors influencing the ability of local government to respond to climate change. The different forms of capital were further categorized by factors and measurable indicators, the latter capturing the highest level of detail. It builds on the concept of governance baselines (Olsen et al., 2009; Stojanovic et al., 2004). The study, conducted in the Western Indian Ocean (WIO), demonstrates its development and initial experimental application through a case study in South Africa. It uses analyses of the information collected using the methodology to inform coastal policy processes relating to climate change adaptation. Different applications of the capital approach framework were undertaken in Kenya (Ojwang et al., 2017), and Mauritius (Williams, et al. submitted) is published or submitted elsewhere.

2 Methods

2.1 Origins of the capital-based framework

The Capital Approach Framework (CAF) used in this paper was based on previous work by Máñez et al. (2014) in which they assessed risk governance in the context of climate change. It is grounded on the premise that the good functioning of a governance system depends on a combination of different "capitals" or the assets, capabilities, properties or other components of that system. It features s*ocial capital* (relationships, networks and shared norms and values); *human capital* (individual skills and knowledge); *political capital* (governmental processes); *financial capital* (financial resources); and *environmental capital* (ecological goods and services). In economic terms a "capital" consists of an asset that enhances your ability to produce flows of economically desirable outputs (Goodwin, 2003). A "capital", in terms of this paper, is understood as the assets, capabilities, properties or other components of a governance system, which collectively represent its ability to function well.

This approach has its origin in the concepts of sustainable development (Goodwin 2003). Viederman (1994), for example, defined sustainability as a community's control and wide use of all forms of capital including: natural, human, human-created, social and cultural capital. He maintained that this control is required to ensure present and future generations can attain economic security and achieve democracy while maintaining the integrity of ecological systems. Another use of the capitals concept comes from the Sustainable Livelihoods Approach "asset pentagon" (Bebbington 1999) which represents the interactions between people's capital assets (human, social, natural, physical and financial), the vulnerability context that affects people's livelihoods, and the policies, institutions and processes that influence vulnerability. These in turn

determine livelihood strategies and ultimately livelihood outcomes (i.e. reduced vulnerability, greater food security, higher incomes, etc.).

There are a number of other frameworks aimed at assessing the institutional requirements for successful adaptive management in general and climate adaptation in particular (Ostrom, 2011). proposes the use of a number 'evaluative criteria' related to economic efficiency, equity, accountability, conformance to local rules and sustainability which can be applied to understanding any kind of situation requiring actors to craft policy responses to a problem. Gupta et al. 2010 propose six dimensions to assess if institutional conditions in place stimulate the adaptive capacity of society to respond to climate change, namely variety, learning capacity, room for autonomous change, leadership, resources and fair governance (see also Gupta et al., 2016; Hurlbert and Gupta, 2016). More recently, Ford and King (2017) also propose a framework based of six factors essential for adaptation to take place: political leadership, institutional organization, adaptation decision making and stakeholder engagement, availability of usable science, funding for adaptation, and public support for adaptation. These different frameworks have overlaps in terms of the factors considered key to drive adaptation, but also differences signaling that there is no consensus or widely agreed criteria for assessment.

The CAF approach has similar elements to that of Gupta et al's (2010) framework. The work of Gupta et al. focusses on the presence and absence of certain conditions that enable institutions to stimulate adaptation to climate change. It also assesses what local governments are actually doing in terms of adaptation (Ford and King 2017) taking the coastal adaptation management as a reference (Tobey et al. 2010). These elements were included in the five capitals they were most relevant to, and transformed into assessment factors, which in turn had one or more evaluation criteria. The overall assessment involved the collection of qualitative (e.g. strength of relationships, leadership) and quantitative (e.g. adaptation budget, number of staff) data from a range of sources. The approach allows for the conversion of qualitative data to categorical data through assigning scores (or categories) to indicators based on criteria set by the researchers or with the involvement of stakeholders (see section 2.2.3 and 2.2.4). This extends the potential for different types of data analysis and reporting, including an inductive approach involving synthesis of the different indicators and factors based on the objectives of each capital and narrative reporting (Thomas, 2006); and a semi-quantitative approach to analysis and reporting using the scores of each indicator.

2.2 Developing the capital approach framework (CAF)

The CAF was sequentially developed, starting with adapting the original framework proposed by Máñez et al. (2014) to fit the governance context of the WIO; and then further modified to be relevant to the country (South Africa) in which it was experimentally applied (Fig. 1).

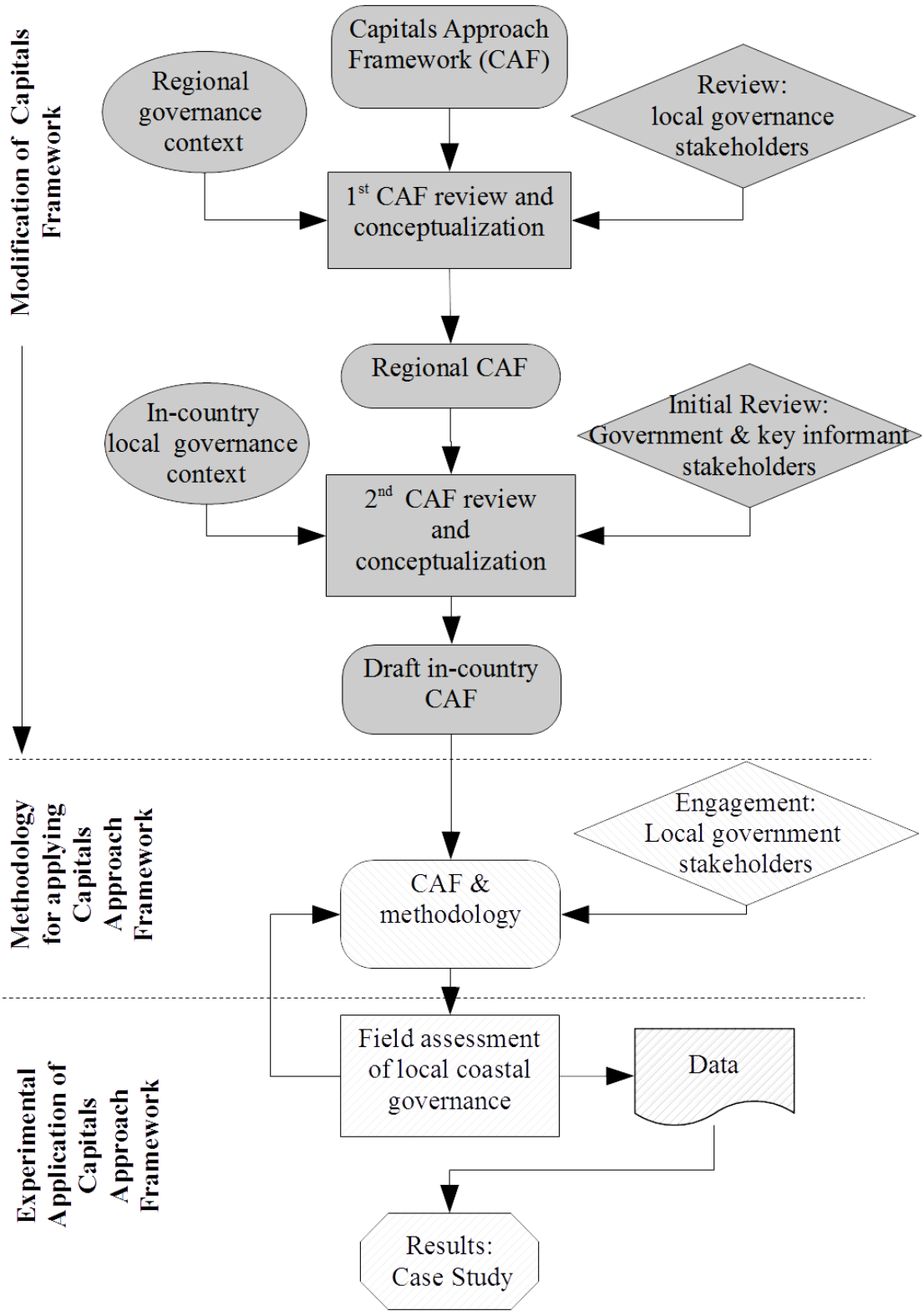

Fig. 1 Sequential development of a context-specific coastal governance assessment framework and methodology adapted from a capital approach. The experimental application is further detailed in Figure 2.

The CAF proposed by Máñez et al. (2014) for the ENHANCE project consisted of 13 factors distributed amongst five capitals. These factors reflected the good functioning of a governance system, in this case relating to risk management. Each factor had a number of assessment indicators as simple presence / absence (yes/no) answers, numbers and percentages.

The adaptation of the CAF proposed in this study involved a review of literature to identify key factors enabling adaptation by local governments, as well as actions in coastal adaptation management. These were then compared with the factors in the CAF of Máñez et al (2014). Many of the factors identified mapped well onto the CAF (for example factors related to stakeholder participation in decision-making, availability and use of knowledge to inform adaptation decisions, competencies and skills, funding, supportive regulatory framework, etc.). Those not reflected in the CAF of Máñez et al (2014) were evaluated for their explanatory potential and included as additional factors under the relevant capital. The elements of the framework were checked and discussed with stakeholders during a number of formal and informal meetings and engagements, including with local and national government in South Africa, within the broader context of nations within the WIO. The modification of the CAF resulted in 20 factors and a concomitantly large number of indicators (Table S1).

The following sections detail the geographical and institutional context of the South African case study, within the broader context of the WIO (see also Ojwang et al., 2017).

2.2 Applying the modified capital approach in South Africa

2.2.1 Study area

The CAF was experimentally applied in the Ugu District Municipality located south of Durban in the coastal province of KwaZulu-Natal, South Africa. South Africa has three spheres of government, National, Provincial and Municipal, the latter constituted by Municipalities. There are three types of Municipalities, namely Metropolitan, District and Local. The criteria for the definition of each type alongside their respective mandates are established in the Local Government: Municipal Structures Act, 1998 (Act 117 of 1998). South Africa's legislation devolves coastal management responsibilities to Municipalities through the National Environmental Management: Integrated Coastal Management (Act 24 of 2008; ICM Act).

Ugu District Municipality comprises six local municipalities. This study focused on Ugu District Municipality and its three local Municipalities located on the coast: Ray Nkonyeni, Umzumbe, and Umdoni. Table S2 provides an overview of key geographical, population and economic characteristics of Ugu District Municipality.

The Ugu district has a relatively diversified economy with the key sectors being tourism, agriculture, manufacturing, community services, construction, trade, the informal sector and transport. The District is a popular domestic tourist destination boasting well-established coastal towns, such as Port Shepstone, Pennington, Uvongo, Margate and Hibberdene. In addition to its lengthy coastline, Ugu hosts a large variety of nature reserves and conservation areas (Mpenjati, Umtamvuna and Mbumbazi Nature Reserves), including the spectacular Oribi Gorge. The bulk of the population of the District is located in rural inland areas on land with limited development potential, characterized by severe topography. Urban development in the District is concentrated

on the coast. Approximately 70% of economic activity in the District is concentrated in the Port Shepstone / Margate area within the Ray Nkonyeni Municipality.

2.2.2 Application of the CAF

The assessment of local coastal governance for each study area was undertaken as per the steps outlined in Fig. 2. The process consisted of the identification of data sources and data collection, followed by iterative data analysis through an inductive approach resulting in three research outputs. These are described in the sections below.

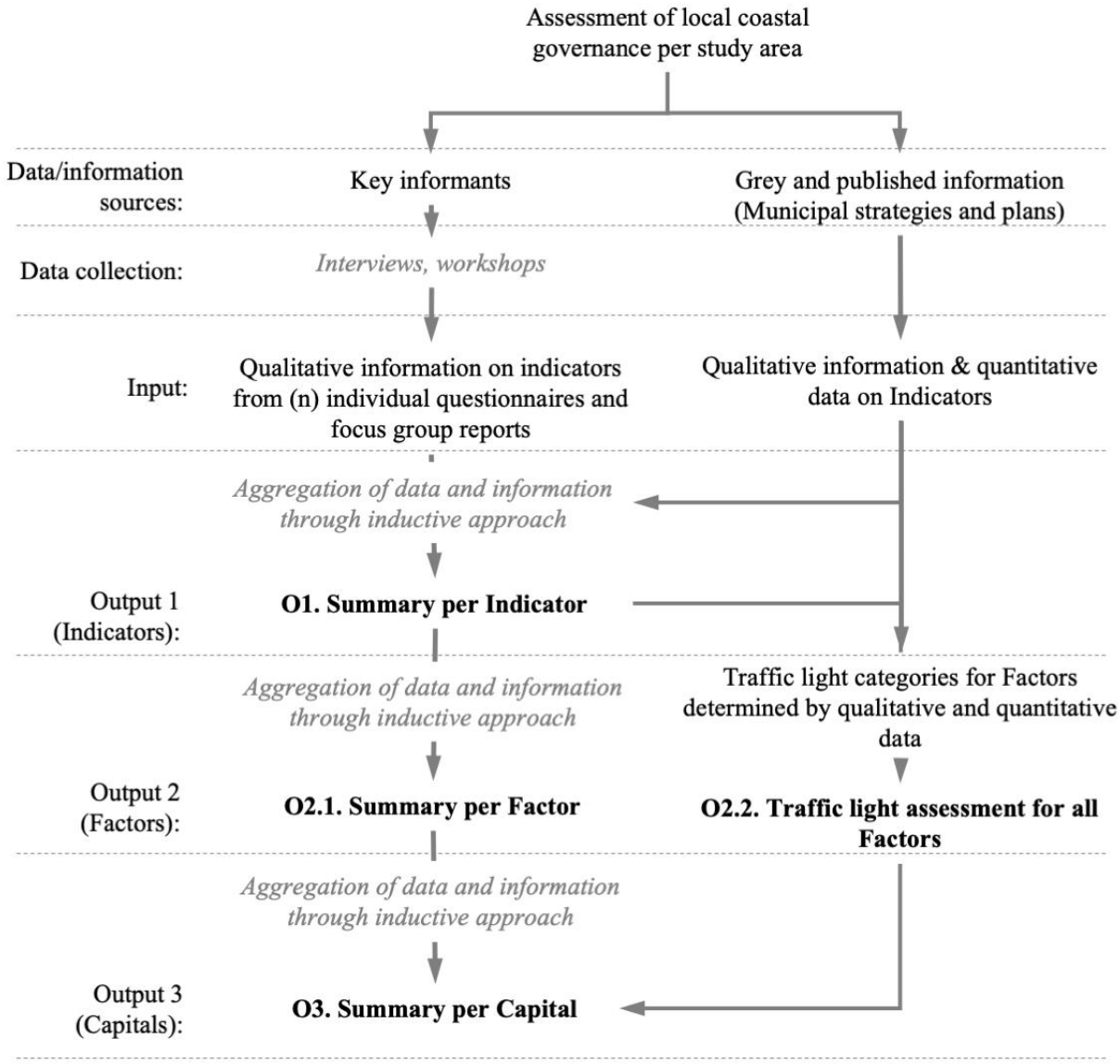

Fig. 2 Data and information collection and analysis to assess the local coastal governance of four coastal municipalities in South Africa.

2.2.3 Data and information sources and collection

The modified CAF (Table S1) was transformed into a list of questions to guide data collection for each indicator (Table S4). Data were collected from key informant and focus interviews, stakeholder workshops and from extracting data and information from published documents in the form of municipal strategies and plans. Table S3 outlines the data sources for Ugu District and the three local Municipalities. Key informants included municipal officials and other stakeholders. Local government officials interviewed came from municipal line functions (departments) dealing with environmental management, planning, risk management or climate change. Stakeholder workshops provided auxiliary data to triangulate the findings. Stakeholders were selected from institutions established by the ICM Act, or informally constituted as a result of its implementation (Celliers et al., 2013; Rosendo et al., 2018). These formal and informal institutions are representative of the most relevant stakeholders in this regard.

The list of questions used to guide data collection was transposed into a spreadsheet with rows for each of the indicators organized by factor and capital. The spreadsheet served as a database to capture the data from the different sources in a synthesized and systematic form.

2.2.4 Data analysis

Firstly, a spreadsheet tab was created for each municipality and data pertaining to each indicator were recorded per information source in consecutive columns. These raw data were condensed into a brief summary format using a general inductive approach (Marshall and Rossman, 1999), resulting in an aggregated assessment for each indicator (Summary per indicator Figure 2; Output 1). This involved scanning the data from each source and, for each indicator, identify common themes, trends and divergences and capturing these into a few short sentences, related to the assessment indicator questions (Table S4). This process was iterated using the summaries per indicator to arrive at a summary per factor (Figure 2; Output 2.1), and from this iterated one last time to obtain a summary of each capital (Figure 2; Output 3).

While the inductive process coalesced the common themes and responses per factor and capital, it also highlighted strong differences in qualitative data from the interview responses. It was deemed desirable to reflect on both commonalities and differences in the data, and explore the reasons therefore with stakeholders.

Secondly, the summaries per factor were analyzed using assessment criteria linked to scores in order to present the data as a categorized color-coded, traffic light system (Figure 2; Output 2.2). The criteria to evaluate each factor were developed by the research team. Criteria were initially proposed by two team members working together and circulated to the rest of the team for comments and additions (see an example of the assessment criteria and scores in Online Resource 5), Criteria were derived from an ideal objective (i.e. 100% households and businesses covered against climate risks) and scores derived from the extent to which this ideal was fulfilled. The scores included *low (1), moderate (3)* and *high (5)*. *Intermediate values (2 and 4)* were also assigned where appropriate. No weightings were applied to the scores, and these were aggregated at the level of factors to provide an overall evaluation. The aggregate scores at the factors level were also converted to percentages to allow comparisons across municipalities.

3 Key findings of the CAF application

The results focus on the experimental application of the modified CAF and a demonstration of its potential use. Results from use of the CAF are presented in two different ways, *viz.* i) a high-level narrative of the findings per capital (Figure 2; Output 3); ii) and, a categorized "traffic-light" assessment by Municipality (Figure 2; Output 2.2). The intention is to highlight the utility of the CAF derived data to inform various aspects of local coastal governance.

The assessment of local coastal governance as a high-level narrative identifies the key commonalities and major divergence in the factors and indicators comprising the capital. An example of narrative aggregating the four Municipalities is provided below.

Financial capital: Generally speaking, the study area is highly urbanized and has a diverse economy, if not a diverse demography, a result from the apartheid legacy. While personal and business insurance was a common buffer against disaster and rapid onset impacts from climate change, especially closer to the shoreline, many landowners and farmers do not have access to these mechanisms. Centers of coastal tourism, mostly urbanized towns, are hotspots for economic activity and municipalities are actively planning growth in such areas. The recognition of the changing climate and potential impacts are, for the most part, ignored. Funding for coastal management and climate change adaptation is still lacking and is absent from Integrated Development Plans, the main mechanism to plan and implement development measures.

Social capital: A key finding of the governance assessment was the apparent lack of either strong internal or external collaboration to achieve common goals. Both the South African ICM Act, and the National Environmental Management Act require a high degree of consensus on environmental or coastal management objectives. These are most commonly negotiated within and between levels of government, and civil society. The South African Constitution embeds a requirement for stakeholder participation that is effectively incorporated into the ICM Act and other environmental legislation. A weakness identified by the CAF assessment is the apparent inability of municipalities, as a collection of different functions and departments, to effectively collaborate to achieve common objectives. It would appear that departmental or line functions are still prioritized over multi-sectorial objectives common to ICM and CCA planning initiatives.

Political capital: Neither ICM nor CCA were considered an immediate political priority and as a result were often not a detectable issue within the management plans of local government. Where there were coastal or climate actions or projects within development plans, they were most likely classified by sector. Even ICM, which is governed by a national act, was not considered a high political priority. Conversely, disaster and risk management, as the management of fast onset and high impact effects, was universally recognizable in municipal development plans. The potential for damage and loss of human life boosts the political priority of disaster risk management. The effect of an insufficient response to short-term intense impacts on coastal communities carries the penalty of diminished voting support.

Human capital: A key finding of the assessment was the recognition that the municipalities suffer from a lack of appropriate coastal and climate knowledge directly sourced and used for management purposes. The assessment highlighted the fact that coastal managers found it difficult to identify the kind and extent of knowledge required for coastal management, and by extension,

climate change adaptation. The use of coastal and climate knowledge was often solely at the discretion of environmental consultants of the municipalities. This identified the necessity of knowledge intermediaries that are unbiased by economic, positional or prominence benefit (*i.e.* consultants) and is a major weakness in the ability to adapt to climate change. The production of science knowledge for use at the local level was either weak or non-existent and the extent of the problem was exacerbated by the lack of a clear and consistent process for incorporation of knowledge into municipal management systems.

Environmental capital: The coastal area of the municipalities assessed offers a number of valuable ecosystem services. Coastal tourism is a cornerstone of the local economy, especially in the urbanized coastal towns. Beach recreation such as swimming, surfing and line-fishing attract many holiday makers and tourists. The sand beaches are susceptible to long-term erosion caused by changes in sediment input from the numerous estuaries along the coast. The coastal area, and human infrastructure and developments are vulnerable to coastal climate vectors such as extreme waves and wave inundation, flooding and erosion.

The equivalent traffic light assessment per factor and capital for the four Municipal areas are shown in Table 1. Key findings under each capital regarding the state of local coastal governance for climate change are presented below.

Table 1 Summary findings of an assessment of factors and indicators of five capitals relating to local coastal governance of South African municipalities.

		Municipalities			
Capitals	**Factors**	**Ugu**	Ray Nkonyeni	Umdoni	Umzumbe
Financial	F1. Nature and strength - local economy	4	3	2	1
	F2. Funds for adaptation	3	1	1	1
	F3. Funds for disaster preparedness	3	2	2	1
	F4. Funds for coastal management	4	3	2	2
	F5. Buffers against climate risks	3	3	3	2
	1.6 Ability to mobilise external funding	3	2	2	2
Social	S1. Internal collaborations	3	2	2	2
	S2. External collaborations	3	2	2	2
	S3. Mandated cooperation	3	3	3	2
	S4. Stakeholder participation	4	4	4	3
	S5. Knowledge and information	3	2	2	2
Political	P1. Regulatory framework	4	3	2	2
	P2. Institutional organisation, political support and leadership	4	2	2	2
	P3. Transparency	3	3	3	3
Human	H1. Human resources	3	2	2	2
	H2. Leadership	3	2	2	2
	H3. Knowledge and skills	2	1	1	1
Environment	E1. Vulnerability of the natural system	2	1	1	2
	E2. Environmental management strategies	3	3	3	2
	E3. Knowledge and information	3	2	2	2

At a strategic level, the district municipality demonstrates greater capacity than local municipalities with a consistently higher performance in all capitals. Financial capital was one of the worse performing capitals, revealing weakness in the capacity of municipalities to mobilize and allocate funding for climate change adaptation, disaster preparedness and coastal management. This partly maps onto the strength of the local economy, but can be compensated by leadership on climate change issues, as it appears to be the case in Ugu Distric, which has recently published one of the first district municipality climate change response strategies (Aurecon, 2016).

Most municipalities also performed poorly in terms of human capital, revealing human resource limitations, associated with equally insufficient level of knowledge and skills relating to climate change. Both constitute key weakness in adapting to local coastal climate change in South Africa. The low performance of environmental capital also points to important weaknesses, which are particularly serious for Ray Nkonyeni and Umdoni. Although the relatively well-developed coastal areas of these municipalities are a major contributor to their local economy, they are also vulnerable to climate impacts and are therefore at risk. The planning patterns of the past decades, which saw residential development right up to the coast, are increasingly becoming a burden for managers and posing risks in a context of low capacity to address them.

The comparative governance strength of the four municipalities is demonstrated using the color scale of the traffic light system. The five forms of capitals assessed for Ugu District, and the length and importance of the coastline, is clearly juxtaposed with that of Umzumbe Municipality, which has a very limited coastal management burden as a result of its short coastline and limited development footprint. Ray Nkonyeni municipality has a much longer coastline which makes a concomitantly larger contribution to the local economy. It was assessed as having the highest investment in the different forms of capital, followed by Umdoni Municipality. With the exception of Ugu District, none of the municipalities were particularly highly rated for the forms of capital needed to undertake coastal management and climate adaptation. While Ugu did show a higher investment in the capitals assessed, it is also limited, by its district and operational mandate, to its execution of coastal management and climate adaptation actions within the local municipalities.

4 Discussion

This paper set out to establish a method to assess the state of local coastal governance already challenged by a changing climate. Governance, defined as the coordinated action and activities of the state and civil society, is the key enabling condition for the achievement of the United Nations' Sustainable Development Goals. With that in mind, this method, based on the use of five capitals, aims to provide comprehensive, relevant, understandable and credible results to aid the mitigation of governance weaknesses towards achieving sustainability. This means that governance can be consistently "measured" in the same way that the state of the environment or coast can be measured using indicators.

The CAF allowed for a comprehensive assessment of a number of factors and indicators for local coastal governance. Due to the comprehensive nature of the framework, it became possible to describe the local implementation of ICM, and the actions for adapting to climate change. The interpretation or insight provided by the capitals data was useful at multiple levels within the governing structure of local government. Reporting on the summaries per indicator provided a

high level of detail useful to technical and planning staff (Figure 2; Output 1), while summaries per factor provided sufficiently detailed information for managers (Figure 2: Output 2.1 and 2.2). The capitals' summary was useful at the political level and for councilors, due to its highly condensed format (Figure 2; Output 3).

The authors previously acknowledged that governance comprises a complex collection of state and civil society accountability and responsibility; formal and informal arrangements, structures and functions, institutions, and organizational traditions and values for the purpose of achieving common objectives (Independent Evaluation Group of the World Bank, 2007; Olsen et al., 2011). Any attempt to assess and measure such a complex concept would require a high degree of credibility of the process and results by the stakeholders. In this study, the credibility of the modified capitals approach was established using at least three engagement steps throughout its development. The engagement with stakeholders was particularly important for developing a detailed composite to derive the five capitals as a measure of governance.

The contribution of key governance stakeholders and experts was useful in maintaining pragmatism throughout the modification of the framework. During the first assessment workshop, a number of issues were raised concerning the application of the framework. One such issue was the effort required to guarantee local government engagement with the assessment. This may influence the uptake by local coastal managers since "assessment" can be viewed as an evaluation of performance, which may not interest underperforming local governments. Another issue was the need to contextualize comparisons, especially between local governments due to the contextual differences relating to human capacity and resources, demography and coastal land-use. Stakeholders also raised the importance of the institutionalization of the framework and the methodological approach within local government.

The objective value of the framework is its ability to assess the change in or progress of the state of coastal governance over time (Máñez et al., 2014). None of the examples of the use of the capitals approach have disaggregated the capitals to the extent proposed here. This study has created a pragmatic and implementable framework and process to logically and consistently measure the strength of each individual capital. Not only did this method return a total numerical value for each capital, but it also provided an in-depth assessment of composite factors and indicators for that capital. This allows repeatability over time and the inclusion of governance as an important and measurable component of any assessment of progress against goals or targets such as national development goals, the United Nations Sustainable Development Goals, and many others. The capitals approach can, no doubt, be further refined through the agreement on weighting of indicators and this remains a valid strategy possible through engagement with the governance actors to which the framework applies.

The capitals approach proposed in this study adds to existing tools to assess the extent to which institutions stimulate the adaptive capacity of society to respond to climate change; and to help determine whether and how institutions need to be redesigned to facilitate adaptation. The Adaptive Capacity Wheel proposed by Gupta et al. (2010, see also Gupta et al., 2016; Hurlbert and Gupta, 2016) focusing on six dimensions of adaptive capacity of institutions, namely variety, learning capacity, room for autonomous change, leadership, resources and fair governance is one of such tools. The CAF offers a comparable approach tailored specifically for use in the coastal

domain, examining local coastal governance for climate adaptation through the lenses of ICM. Its reliance on engagement with stakeholders for framework development and data collection showed potential to stimulate learning which is a key ingredient for adaptive management (Schreiber et al., 2004).

Ultimately, the modality of assessing a local governance baseline is less important than the actual accomplishment of providing targeted information about the capacity of local coastal governance to engage the various forms of adaptive management required in the Anthropocene (Jentoft and Chuenpagdee, 2009; Ostrom, 2005; Stojanovic et al., 2004). The value of the coastal governance baseline is not only important to inform from the "outside-in", *i.e.* looking in at the condition and capacity of coastal governance at the local scale. In the presence of functioning adaptive management processes, the coastal governance baseline is also a powerful contributor to the monitoring and evaluation aspect of the policy cycle associated with the similar processes of ICM and CCA (Ehler et al., 1997; Ford and King, 2015; GESAMP, 1996). This allows institutions to get an "inside-out" view of how well they are performing in order to better, and faster, evaluate and adjust their policy processes (for e.g., ICM and CCA) to respond better in a changing climate context (Olsen et al., 2009).

The data analysis demonstrated that the local government system in South Africa was highly organized and regulated, but the mainstreaming of climate change adaptation was not widespread. The local coastal governance is formalized within a nested system of governance for both ICM and CCA. Climate change adaptation as a concept was readily and regularly tabled at workshops and interviews but in reality, was weakly incorporated in the key municipal management instruments (Integrated Development Plans and Spatial Development Frameworks).

While the data and information of the capitals was immediately useful, the engagement process itself allowed local government officials to interrogate their objectives in relation to ICM and CCA. The methodological approach described in this paper was an important mechanism for negotiation between local government officials, as well as being a tool for raising awareness of the actions and conditions required for local coastal governance in a changing climate.

The CAF and the methodological approach allowed for an opportunity to engage local government stakeholders. Ideally, the assessment should be a self-examination tool. Developing such tool is part of the future research relating to the capital framework. The repeated engagement between researchers and municipal staff promoted learning and the practice of adaptive management. The power of this approach, especially the traffic-light system, is its relative ease of implementation and bounded responses. This could also be perceived as a weakness, should the categories not be tested and updated with stakeholders.

The CAF was simultaneously developed in South Africa, Kenya (Ojwang et al., 2017) and Mauritius (Williams et al. submitted). The results from the CAF from the three countries were not immediately comparable primarily due to the context specific adjustment of the indicators. While it may be possible to derive general differences and similarities between local governments in different countries, the CAF was not designed for this purpose and the results indicated that a direct comparison of results would not be useful or helpful.

Finally, the amended CAF proposed here remains largely a concept based in theory. While the CAF was used to evaluate governance as per the objectives, it was not operationalized and implemented by any local municipality in South Africa. The research has demonstrated that the CAF is able to provide structured information on the state of coastal governance and climate adaptation, but its implementation is subject to a deeper understanding of barriers and limitations of local decision-making.

5 Conclusion

The temporal assessment of coastal governance in relation to ICM and CCA offers promise as a tool for monitoring and evaluation of actions towards implementation. The CAF assessment is potentially repeatable and can identify progress towards longer-term coastal management and climate adaptation goals as well as areas requiring improvements. Ultimately, it can be developed into a self-assessment tool to help local government to think reflexively about how they are managing the coast and the climate risks impacting on coastal assets and people. The role of knowledge in ICM and CCA was evaluated by a number of factors in more than one capital. The importance of knowledge (and the lack thereof) for all the management process, especially for ICM and CCA, was supported by the findings of the governance assessment. This also emphasizes the multiple uses of governance data collected as components of capitals. This CAF requires more work in terms of comparison with other similar methods such as the Adaptive Capacity Wheel (Gupta et al., 2010), and others. The relationship between the five capitals also requires more examination. Finally, a greater pool of case studies assessed over time may increase the robustness of the CAF.

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