IMPLEMENTING INTEGRATED COASTAL MANAGEMENT IN A SECTOR-BASED GOVERNANCE SYSTEM

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ABSTRACT

Over the last four decades the development of frameworks for integrated coastal management (ICM) and models for ICM implementation have received much attention from researchers and practitioners alike. This has resulted in a proliferation of implementation models, many of which embody results-based approaches, with the primary focus being on identifying coastal issues and then addressing these by implementing specific projects or programmes. Despite explicitly recognising the importance of cooperative governance early on, ICM implementation still faces the challenge that governance systems remain largely sector-based. In this paper we explore the implementation of ICM within a sector-based governance system in South Africa. First, we draw on international best practice and situated knowledge to develop a prototype ICM implementation model designed to accommodate sector-based programmes within an overarching ecosystem-based approach. Next, we assess the usability of the prototype and the compatibility with a sector-based governance system using empirical information derived from South Africa's National Programme of Action to protect the marine environment from land-based activities. We conclude that integrated management of the coast is possible in a sector-based governance system and propose the ICM implementation model developed in this paper as a potentially suitable model for countries with similar coastal management milieus to South Africa.

Key words: ICM implementation, sector-based governance, cooperative governance, marine spatial planning, ocean zoning, South Africa [1]

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[1] ICMA - National Environmental Management: Integrated Coastal Management Act (South Africa)
NEMA - National Environmental Management Act (South Africa)
NPA - National Programme of Action to protect the marine environment from land-based activities
NWA - National Water Act (South Africa)

1. Introduction

Prior to the twentieth century, use of the sea was limited to a few activities (e.g. fishing and navigation) that rarely influenced one another and a traditional sector-based approach to ocean and coastal management sufficed. However, rapidly increasing use of the ocean and coastal environment gave rise to conflicts amongst uses inadequately addressed by sector-based governance structures alone (Cicin-Sain and Knecht 1998) thus precipitating the need for an integrated approach to coastal management. Indeed, since the 1970s, the development of frameworks for integrated coastal management (ICM) and models for implementation have received much attention from researchers and practitioners alike. Many review articles on ICM highlight the key lessons learnt, contributing to a wide body of knowledge on ICM implementation and a deep understanding of the variety and diversity in ICM practice worldwide (e.g. Christie, 2005; Christie et al., 2005; Cicin-Sain and Knecht, 1998; Lowry et al., 1999; Olsen et al., 1997; Olsen, 1998; Olsen et al., 1999; Olsen and Christie, 2000; Shipman and Stojanovic, 2007; Sørensen, 1993; Stojanovic et al., 2004; Tobey and Vlok, 2002; Yao 2008). Frameworks and implementation models include the cross-sectoral integrated coastal area planning (CICAP) process (Pernetta and Elder 1993), the model proposed by Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP, 1996), the World Bank Guidelines (Post and Lundin, 1996), Olsen's ICM cycle (Olsen et al., 1997; Olsen et al.,1999), the ICM guidelines of Cicin-Sain and Knecht (1998), the European Union Integrated Coastal Zone Management Recommendations (European Commission, 2002), the Canadian Integrated Management model (DFO 2002) and the Australian implementation model (NRMMC, 2006). More recently, a flexible cyclical umbrella model was proposed by the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) (UNEP/GPA, 2006). Most of the implementation models embody strong result-based approaches that focus on the identification of coastal issues and their subsequent resolution through specific and directed projects or programmes. Despite an emphasis on the importance of cooperative governance in the implementation models from the early days of ICM onwards, the governance systems within which ICM is applied have remained sector-based. In a recent analysis of the theoretical roots of ICM practice, Taljaard et al. (2011) distilled three core means by which ICM implementation can be enhanced in the future. First, the need to strengthen the ecosystem-based management approach (Weinstein et al., 2007) is emphasised because in ecosystem-based management the ecosystem becomes the focal point within the broader ecological, social, and economic context rather than specific sectors, projects or programmes, and management is achieved through cooperative governance across different sectors (Balchand et al., 2007; Moomaw, 1996; UNEP, 2006). Second, the implementation of the concepts of ocean zoning deriving from marine spatial planning (Agardy 2010; Douvere, 2008; Ehler and Douvere, 2009; Gilliland and Laffoley, 2008; Halpern et al., 2008; Halpern et al., 2012; Jentoft and Chuenpagdee, 2009) form a focus of attention and third, following Norse (2008) and Crowder and Norse (2008), the explicit expansion of cooperative environmental governance (Biermann and Pattberg, 2008; Cicin-Sain and Knecht, 1998; Hague and Harrop, 2007; Henocque, 2001; Paavola, 2006; Van Wyk, 2001) is identified as critical to effective ICM in future. Clearly there is a need to develop an implementation model that remains true to the

conceptual underpinnings of ICM, incorporates the insights regarding the means by which implementation can be enhanced and yet accommodates the prevailing conditions of sector-based governance. In this paper, the design of such an ICM implementation model and its test application in South Africa are presented.

In investigating how ICM can be applied in a sector-based system, we move to an exploration of the South African situation. In 1994 South Africa experienced a transition to democracy, adopting a power-sharing democracy as the basis of its political system (Karume, 2003) and this more pluralistic slant is evident in the country's post-1994 environmental legislation. For instance, the Coastal Policy (RSA, 2000) aims at a participatory approach driven by human development imperatives and the need to promote sustainable livelihoods as distinct from the pre-existent predominantly biophysical and bureaucratic approach to coastal management (Glavovic, 2006). The Coastal Policy acquired legal status in 2008 with the promulgation of the National Environmental Management: Integrated Coastal Management Act (ICMA) (RSA, 2009). Indeed, South Africa has a number of statutes and systems for the implementation of ICM, but these are largely fragmented and sector-based and are likely to remain so. Herein lies a major challenge to achieving effective implementation of ICM in South Africa, as already identified by Glavovic (2006). In a review of environmental governance in South Africa, Müller (2009: 92) criticised the idea of institutional reform as the appropriate response to the (sector-based) fragmentation viewed by many as the primary challenge facing environmental governance in South Africa. Instead, he views "the emergence of the smaller nimble postmodern organisation, with lower level of hierarchy and control" as a possible remedy able to cope with the "fast-changing technologies and environments" characteristic of the modern age. In this paper, we follow Müller's reasoning and design such a remedy in the form of a prototype ICM implementation model for use within a sector-based governance system. We determine the usability of the prototype and its compatibility with a sector-based governance system using the test case of the South African National Programme of Action to protect the marine environment from land-based activities (NPA), an obligation that the country had to fulfil under the GPA. The paper concludes by proposing the prototype as a suitable implementation model for countries with similar coastal management milieus to South Africa, that is extensive existing legislation and numerous initiatives supporting ICM already in existence, but governed under a sector-based system.

2. Research Methods

In this paper we do not adopt traditional environmental science methods (experiment, monitor, analyse results), but instead use a design science approach in our research. A design-science approach (Bots, 2007) is characterized by the development and testing in practice (empirical validation) of a prototype design. The research focuses on the policy implementation component of a policy process (De Coning, 2006; Glavovic, 2009; Glavovic and Cullinan, 2009), in particular the coordination, integration and operationalisation of policy pertaining to the coastal marine environment.

First, a prototype model was designed using international best practice guidelines for ICM and (incomplete) contextual knowledge (Flyvbjerg, 2001), that is the situated knowledge of the authors garnered over more than twenty years as environmental scientists and consultants. Next the usability and compatibility with a sector-based governance system is assessed in a practical (or empirical) validation using a South African case study. Finally, the paper concludes by indicating the degree of fit found to exist between the prototype model and the empirical test case, and the actions required to improve the theoretical and contextual fit for ICM implementation internationally. The choice for an incremental, and sequentially adaptive approach whereby knowledge derived from empirical testing is indicated as useful for refining the final design (Bots, 2007) is supported by claims in the ICM literature regarding the contextual nature of ICM implementation (e.g. Cicin-Sain and Knecht, 1998) and the importance of considering contextual knowledge (e.g. UNEP/GPA, 2006).

The empirical testing of the prototype is undertaken using information on coastal management in South Africa sourced from available literature and verified by experts in coastal management in South Africa. In particular, the usability of the prototype and its compatibility with a sector-based governance system is determined using the NPA, the full details of which are captured in the document *South Africa's national programme of action for protection of the marine environment from land-based activities* (DEAT, 2008). The verification of the information was conducted through the National Advisory Forum, a body of experts specifically appointed by the South African government to oversee the NPA development and implementation process. Inputs and comments from the forum members were obtained at National Advisory Forum meetings (held on 27 April 2007, 30 October 2007, 28 February 2008 and 21 April 2008). Members include representatives from government departments (primarily at national and provincial level) and from non-governmental organisations with an interest in the protection of the coastal marine environment or the management of activities which may influence, or be influenced by, the state of the coastal marine environment. Information from the Saldanha Bay/Langebaan Lagoon system (Taljaard and Monteiro, 2002) is used in assessing the usability and compatibility at the local level. Although the case study concentrates on the management of land-based activities in the coastal marine environment and does not address sea-based activities such as offshore oil exploitation, discharge of ballast water from ships or foreign marine species introduction, it is considered suitable for the empirical testing of the ICM implementation model as it covers a diverse range of fifteen activities with eight associated sectors.

3. Prototype Model

The extensive literature on frameworks and ICM implementation models (Cicin-Sain and Knecht, 1998; DFO, 2002; European Commission, 2002; GESAMP, 1996; NRMMC, 2006; Olsen et al., 1999; Pernetta and Elder, 1993; Post and Lundin, 1996; UNEP/GPA, 2006) reveals there is no international, generic blueprint that can be applied routinely to yield predictable and desirable outcomes. The majority of articles documenting the evolution of ICM and learning from the ICM experience emphasise the contextual nature of

ICM implementation and the importance of considering country-specific knowledge (e.g. Cicin-Sain and Knecht, 1998; Olsen et al., 1997; UNEP/GPA 2006). The GPA even states that "As needs and priorities vary greatly between countries, action has to be tailor-made" (UNEP/GPA, 2006: i). As one of the most recent international ICM implementation models, the GPA approach effectively consolidates international best practice (UNEP/GPA 2006). Like many of the earlier ICM implementation models (e.g. GESAMP 1996; Olsen et al., 1999; Pernetta and Elder, 1993), the GPA's approach (UNEP/GPA, 2006) exhibits a strong problem focus (or issue-driven approach), and identifies a sequence of specific tasks or components to be undertaken. These include (i) the initial identification of problems; (ii) the identification of constraints and opportunities; (iii) the formulation of realistic strategies and actions; (iv) the associated implementation of the actions and strategies; and (v) monitoring, evaluation and revision. The value and relevance of this approach, applied in many of the earlier ICM models, is acknowledged by using it as the basis for the design of the prototype model. The process of designing the prototype is illustrated in Figure 1, which depicts the conceptual evolution from the predominantly result-based management approach into a more ecosystem-based management approach in three distinct phases.

Prototype Development Phase I: The traditional components (or tasks) of a results-based approach are reflected in the s*ituation assessment* (e.g. gather knowledge and scientific information on the coastal marine environment, identify problems and constraints and opportunities), the *management programmes* (i.e. formulate realistic strategies, action plans, and implement these strategies and plans) and the *monitoring and evaluation programmes.* Experience with the implementation of marine water quality management in South Africa (Taljaard et al., 2006a; Taljaard and Botes, 1995), indicated that placing the ecosystem centrally and explicitly agreeing on 'common, overarching' environmental quality objectives – rather than allowing different sectors, projects or programmes to derive their own (often conflicting objectives), was of proven value in a strong sector-based governance system. Further experience from marine water quality management also led to an appreciation of the value of delineating appropriate geographical boundaries for ecosystem management units and explicitly mapping uses of the environment and the resources within such units. The delineation of ecosystem management units facilitates explicitly identifying and addressing potential cumulative or synergistic effects in situations where numerous activities and uses occur within the management unit boundaries. Taljaard et al. (2006a) included the identification of common, overarching environmental objectives and zoning of uses as an explicit action in their water quality management framework – within their component: Establish environmental quality objectives. This situated knowledge of marine water quality management in South Africa provided the basis for including similar tasks into the prototype model.

Prototype Development Phase II: The traditional, problem-based approach was expanded to incorporate elements from ecosystem-based management and spatial planning by embedding the following components in the model, *set a vision and resource objectives* for the coastal system considering ecological, social and economic aspects (i.e. putting the entire ecosystem centrally) and *zone management units and specific uses*

within the unit (Figure 1). The explicit inclusion of elements from ecosystem-based management and marine spatial planning into the prototype – by including the 'Resource[2]: vision, objectives and zoning' component – shows that the ecosystem-based and results-based approaches can be complementary rather than conflicting.

Prototype Development Phase III: In this phase the support elements, that is the cross-cutting elements necessary for the successful operationalisation of the tasks within the GPA framework (UNEP/GPA, 2006), were included. The support elements primarily revolve around the organisation and involvement of *actors* in the management cycle, alluding to the importance of cooperative environmental governance. Taljaard et al. (2006a) also recognised the importance of collaborative actor involvement. In the 'Management institutions and responsibilities' component of their water quality management framework, institutions are required to include all relevant interested and affected parties in order to facilitate a participatory approach in decision-making. The success of the management institutions relies on sound and easily accessible scientific information to empower stakeholders to participate in the decision-making process. Finally, three support elements are viewed as essential for to the enhancement of cooperative environmental governance in ICM implementation in South Africa and are incorporated in the prototype model (Figure 1). These are the *institutional structures and arrangements* to facilitate effective environmental governance; well-organised *capacity building* programmes; and *public education and awareness* programmes and initiatives.

Throughout the process of designing the prototype, the ICM implementation model is represented as a cyclical process. The cyclical process emphasises the importance of continuous adaptation based on new learning, thus allowing for a systematic refinement of the overall implementation process, and reflects the adaptive policy cycle of Plan-Do-Check-Act (UNEP/GPA, 2006). While the importance of identifying specific tasks in the management cycle and articulating their logical sequencing is commonly understood as necessary, here it is the informed and well-established actor networks (organised within the three support elements) that are viewed as the crucial drivers in the successful and sustainable implementation of ICM.

In the following sub-sections each of the components and the support elements of the prototype ICM implementation model is discussed in turn.

3.1. Situation Assessment

The purpose of the situation assessment is to consolidate the available information of the management of the environmental system. Aspects to be addressed in an ICM situation assessment include: The status and importance of the coastal marine environment; Key sectors (and associated activities) contributing to existing problems, posing threats or using the natural environment; The existing statutory framework and governing

[2] In this context the term "Resource" was specifically chosen instead of "Ecosystem" as the latter can be perceived by some to only refer to the 'biophysical system' and not the system in its entirety (i.e. also considering social and economic resource uses).

structures; and Opportunities and constraints that are relevant to the coastal system (UNEP/GPA, 2006). In short, the situation assessment describes the ecological, social and economic context within which an implementation model must function. Importantly, existing management initiatives need to be identified to ensure that the implementation of the model builds on existing programmes, assessments and research rather than re-inventing the wheel.

3.2. Resource vision, objectives and zoning

This component deals with the common, overarching vision and objective setting for the environmental resource, as well as the geographical demarcation (zoning) of management units and uses in the resource. It is incorporated in the prototype model in order to place the ecosystem centrally thus including the ecosystem-based management explicitly. The ecosystem, and its goods and services (as agreed upon by stakeholders), determines the geographical boundaries of the unit, as well as the resource objectives which need to be complied with in the management of activities and/or developments potentially affecting the resource. Three distinct sub-tasks are apparent, namely the delineation (zoning) of the geographical boundaries of the management unit, the demarcation of specific use and activity zones within the management unit and the setting of a specific vision and resource objectives related to the ecosystem and its uses. These sub-tasks are discussed in turn in the next three sub-sections.

3.2.1. Delineation of management unit

A central element in the ecosystem-based management approach is the delineation of the appropriate ecosystem management unit (i.e. establishing the geographical management boundaries) (Halpern et al., 2008). Management units can be delineated at the multinational, national and regional scales, but also at the local level. Local coastal management units are considered central to people-centred environmental management as they provide a platform for local communities to play a strong role in coastal management (DFO, 2002).

Typically, larger marine management units cover extensive areas, subdividing a country's waters stretching from a demarcated boundary inshore out to the seaward limit of the Exclusive Economic Zone. Large marine ecosystems (LMEs) or bioregions have also been used to demarcate geographical boundaries of large marine management units at multinational, national or regional scales (e.g. DFO, 2002; NOAA, 2011). Demarcation of the geographical boundaries of the local (smaller) coastal management units is more difficult. Because most of the threats posed by intensifying human activities and ecosystem change cannot necessarily be dealt with by managing river basins, coastal zones and larger marine ecosystems in isolation (UNEP/GPA, 2006), it makes practical sense to define the local management unit to deal with the effects manifested locally, while recognising the interactions with larger and/or adjacent environments. For the coastal marine environment adjacent to urban centres, the urban centres can be appropriate departure points for setting the geographical boundaries of local coastal management units. Local coastal management units

(e.g. bay, bight, estuary or harbour), are often nested in a larger management units (e.g. LMEs or bioregions), and also linkto adjacent river basin (or catchment) management units as conceptualized in Figure 2. Because the ecosystem is the primary consideration in the demarcation of management units (in accordance with the ecosystem-based approach) understanding and acknowledging ecosystem processes and functioning is essential. Qualified scientists are therefore critical actors to involve in the demarcation of management units, in collaboration with responsible government authorities and other affected actor groups.

3.2.2. Setting specific vision and resource objectives

In ecosystem-based management it is not only the ecological, but also the economic, social and cultural aspects of the resource that are important (UNEP, 2006). All these aspects should be reflected in the common and overarching vision and resource objectives for a particular management unit. Thus, in setting a vision and resource objectives, the focus should be on ecosystem protection (i.e. ecological resource objectives), as well as the important goods and services provided by the coastal ecosystem and the potential opportunities it offers for sustainable coastal development (i.e. social and economic resource objectives). The process of setting vision and resource objectives is hierarchical. For example, the strategic vision and resource objectives for a country's coastal marine environment are set at the national level, while site-specific (local) resource objectives for a particular coastal management unit can best be set at the local level utilizing locally specific knowledge.

In the prototype model, the setting of the vision and resource objectives at both the strategic and local levels is a participatory, multi-actor (and multi-sector) process involving all the relevant actors (e.g. government, business, civil society, and the scientific and professional communities). The setting of a common vision and shared resource objectives, within a multi-actor (and multi-sector) context, is crucial as it prevents situations in which individual sectors define their own (often conflicting) resource objectives at the sectoral-level for the same coastal ecosystem. An example of conflicting objectives is when the mining sector allocates mining rights in areas that the conservation sector wants to earmark for biodiversity protection. Conflict management plays an important role in setting the vision and resource objectives of ICM implementation (Cicin-Sain and Knecht, 1998). Further, pressures (or direct causes) as well as root (or indirect) causes of the problems in the coastal marine environment must be considered to determine whether the vision and resource objectives can realistically be attained. The carrying capacity or limits of the ecosystem for human use need to be considered as it might not be possible to attain specific resource objectives within the short-term owing to existing pressures. For instance, insufficient finances to improve wastewater treatment facilities can result in non-compliance with water quality objectives in areas earmarked for recreation. In such a case, intermediate resource objectives (e.g. Olsen, 1998) can be identified to provide incremental measures to track progress. Periodic re-evaluation and refinement of resource objectives can then be implemented to ensure that the desired vision is ultimately attained. Once the vision and resource objectives (and zoning) have been agreed upon and the achievability has been validated against the social and economic milieu that influences or may be influenced by the coastal system under consideration, they provide an overarching

measure against which the acceptability or sustainability of *management programmes* for the various sectors (or activities) can be evaluated.

Ultimately, to be useful for management, the resource objectives must be translated into measurable targets for appropriate indicators (suitability criteria). While the zoning of uses in management units may vary, the suitability criteria related to a specific use are more generic and are typically captured in regulations, standards or best-practice guidance. For example, best-practice guidelines for water and sediment quality, published by many governments across the world (e.g. ANZECC, 2000; DWAF, 1995; Taljaard, 2006a) provide guidance and information on defining measurable target values for water and sediment quality indicators so as to achieve resource objectives for conservation, recreation and mariculture amongst other uses.

3.2.3. Zoning of uses within management units

The geographical mapping or zoning of agreed uses and activities within the coastal management unit (Agardy, 2010; Halpern et al., 2008; Jentoft and Chuenpagdee, 2009) forms an integral part of the resource vision, objectives and zoning component in the prototype model. The nature and distribution of use areas in the coastal marine environment is site-specific and may vary across different geographical scales. For example, in large marine management units zoning typically addresses uses such as marine protected areas, fishing zones, oil and mineral exploration concessions and shipping routes. Within local coastal management units, zoning typically comprises detailed mapping of: residential, industrial and commercial development; conservation areas; recreation zones; living resources exploitation zones; mariculture areas; ports, harbours and shipping routes; wastewater discharge sites; and waste dumping areas. Through zoning, the use of the resources becomes explicit, creating a communication tool accessible to the stakeholders. Maps are of great value in multi-actor contexts (Carton 2007) and specifically in stakeholder consultation processes in South African marine water quality management programmes. Also, zoning provides a powerful spatial tool to identify and resolve potentially conflicting uses.

The identification and selection of compatible uses in a coastal management unit requires careful evaluation of ecological, social and economic opportunities and constraints (as documented in the situation assessment) while considering both the existing and future situations. Potential conflict among various uses is likely to occur in highly used urban coastal systems and trade-offs will have to be negotiated. The demarcation of use and activity zones within management units needs to be undertaken in consultation with the relevant actors, including the responsible government authorities and affected groups. In the case of local coastal management units the local authorities and stakeholders in the community will be integral to this process. Processes such as strategic environmental assessment (Partidário, 1996) and marine spatial planning (Ehler and Douvere, 2009) can be applied to inform decision-making.

3.3. Management Programmes

Nel and Kotze (2009:10) aptly note that in environmental management "…the environment is not managed, but that *activities, products and services* (own emphasis) are managed to prevent undesired change to the affected environment." This argument also applies to ICM where management programmes should aim at preventing undesired potential impacts on the environment, rather than responding only once the impacts have occurred. Ultimately the collective aim of such management programmes is to achieve the common vision and shared resource objectives for a particular coastal management unit. Together with the agreed zoning scheme, the vision and resource objectives provide the benchmark against which to select suitable locations, technological options and compliance targets for any given activity, product or service potentially affecting the coastal marine environment. In the prototype model management programmes that are largely sector-based are chosen as the means of anchoring the management of activities, products and services in the ecosystem-based approach. Three subcomponents are included in the management programmes component of the prototype model, namely the identification of key sectors for which management programmes are provided, determining management strategies and actions for the various sectors and the prioritisation of management strategies and actions for operationalisation. These sub-tasks are discussed below.

3.3.1. Identification of sectors for inclusion

The identification of specific sectors for which management programmes need to be developed is important and the identified sectors need to cover both existing as well as planned activities. Results-based management approaches often refer to this as the identification of the issues and problems. While the common vision and shared resource objectives need to be agreed upon at the cross-sectoral level, the management programmes involving the technical planning and operations of specific activities can maintain a stronger sectoral focus, thereby accommodating sector-based statutory and institutional systems. The expertise to develop and implement these programmes typically resides with the responsible sector authorities, their service providers, and the developers and managers of the activities. For example, a management programme for wastewater requires technical and engineering expertise on the technologies available to prevent, minimise, treat and dispose of wastewater. These skills reside in the waste and wastewater (technical) sector and are not located, for instance, in the conservation sector although the latter may be negatively impacted by inappropriate wastewater treatment. In this way, sector-based management programme silos are embedded in an ecosystem-based management model, anchored in the overarching resource vision, objectives and zoning and the monitoring and evaluation components as illustrated in Figure 3. This implies that management programmes, even though largely sector-based, remain grounded in an ecosystem-based approach, subservient to the agreed requirements and needs of the coastal ecosystem.

3.3.2. Determining management strategies and actions

The situated knowledge of the authors was drawn upon in formulating the process of determining management strategies and actions within the prototype model. Management strategies and actions are formulated for each of the selected sectors or for particular activities in a nested fashion using four primary sources. Each of the four sources provides information necessary for the proposed nested and structured approach to determining management strategies and actions within the management programmes.

Firstly, how the management and control of the activity as addressed in *legislation* (acts) is checked and the overarching principles, rules, procedures or limits to strategies and actions are distilled. Secondly, r*egulations and best practices* (e.g. environmental impact assessment regulations) are consulted. The regulations and best practices guide the operationalisation of the legislation and include best available technologies, the specification of critical limits (e.g. effluent emission targets), the minimum (compliance) monitoring requirements, and efficient penalty and/or incentive systems. They provide information on how to translate legislation into (sector-specific) management, but do not yet specify particular site-specific management strategies and actions. The third and fourth steps in determining management strategies and actions provide this level of detail. Thirdly, determination of specific strategies and actions for the execution and enforcement of legislation, regulations and best practice using sufficiently skilled and motivated personnel, equipped with the appropriate material and financial resources throughout the *planning and design, construction, operations and decommissioning* phases of a (sector-specific) activity. The precise project planning method used in this step may vary between sectors. In environmental management, the Deming cycle is a popular and widely used management model, particularly in ISO14001-based management systems (Nel and Kotze, 2009). Finally, determining, designing and implementing *compliance monitoring*[3] to measure the effectiveness of the management programme related specifically to the sector or particular activity.

3.3.3. Setting priorities for operationalisation

Management strategies and actions within a specific sector or for a particular activity occur at many levels of government. For example, the legislation, regulations and best practice guidelines are typically formulated at the national level, while compliance monitoring typically occurs at the local level. This obviously requires effective cooperative governance between government tiers. Although management programmes for specific sectors or activities can maintain a strong sectoral focus, institutional systems facilitating cross-sectoral collaboration are nonetheless crucial for the optimisation of actions such as the effective execution of compliance monitoring programmes by sharing human and financial resources across sectors.

[3] In this study *compliance monitoring* refers to the monitoring that is linked to a specific sector (or activity) to establish whether that sector or activity is complying with its specific strategies and action plans as well as the resource objectives of the coastal system that may be affected. Compliance monitoring can include monitoring of specific aspects of an activity (e.g. monitoring the effluent composition and volume) and the resource (e.g. monitoring of coastal waters adjacent to the effluent discharge). The resource component of compliance monitoring may potentially overlap between sectors or activities. Similarly, the resource component of compliance monitoring may potentially overlap with the overarching *monitoring and evaluation* component of the framework. These potential overlaps necessitate institutional systems to facilitate cross-sectoral collaboration.

Decisions on prioritizing management strategies and actions involve multiple criteria and many actors. However, in deciding on priorities, the UNEP/GPA (2006) recommends considering criteria based on the: scale of the environmental impacts and socio-economic consequences caused by the problem (and associated activities); the nature of affected areas (e.g. sensitive areas) and the reversibility of such impacts and consequences; and costs, benefits and feasibility (e.g. availability of resources) of options for action, including the long-term cost of no action.

In the prototype model the prioritisation process is viewed as involving responsible government departments (national, provincial and local) as well as other affected actors, such as the relevant social and economic sectors, non-government organisations (NGOs) and community-based organisations (CBOs). Focal points for action, such as adopted in the Australian ICM framework and implementation plan (NRMMC, 2006), can be useful in facilitating cooperation across tiers of government and across sectors (UNEP/GPA, 2006).

3.4. Monitoring and evaluation

Several ICM-specific evaluation frameworks have been developed and debated over the years (see for example Burbridge, 1997; European Commission, 2006; NOAA, 2004, 2006; Olsen et al., 1997; Olsen, 2003). Specific issues have dominated the debates, including the selection of indicators (e.g. Belfiore, 2003; Olsen, 2003; Pickaver et al., 2004; UNESCO, 2006) and output delivery versus outcomes achievement (e.g. Olsen, 2002). However, Billé (2007: 805) argued that rather than evaluating ICM initiatives as though they are solely responsible for coastal management, the *level* of coastal management should be evaluated, i.e. it is important to recognise that "a coastal management program is not the only or even the main 'coastal manager'". Following Billé (2007), the monitoring and evaluation component of the prototype model allows for evaluation of the actual implementation of ICM against collectively set objectives. Indeed, monitoring and evaluation of the coastal resource and coastal governance system, in addition to compliance monitoring linked to specific sectors or activities, are viewed as fundamental to the effective implementation of ICM because they provide the means of continuously assessing progress toward achieving the overarching 'common' vision and 'shared' resource objectives.

In recent years a results-based approach to monitoring and evaluation has been applied increasingly in environmental management rather than the more traditional implementation-based approach. A major difference between these two approaches, in monitoring and evaluation, is that the implementation-based approach focuses primarily on outputs, while the results-based approach also includes outcomes (Kusek and Risk, 2004). Implementation monitoring, therefore, concentrates on the achievement of actions or outputs of the sector-specific management programmes measured in terms of the objectives. In contrast, results monitoring centres on the achievement of the overarching outcomes and goals measured in terms of the common vision and shared resource objectives. In the prototype model, monitoring and evaluation are

viewed as requiring dedicated long-term programmes that monitor the achievement of actions and outputs (implementation monitoring) and outcomes and goals (results monitoring).

The selection of appropriate indicators is, therefore, essential as these provide the quantitative measures to evaluate progress in the operationalisation of ICM (e.g. Walmsley et al., 2007). It is logical that the appropriate (resource) indicators and associated measurable targets – earlier derived as part of the resource objective setting process – will be beneficial in this regard. However, process indicators or quantitative measures to evaluate progress in actor involvement as described in the support elements hereafter are equally important. State of the environment or State of the coast programmes can provide platforms through which to operationalise the overarching monitoring and evaluation component within the ICM implementation process.

3.5 Support elements

The execution and sustainability of ICM implementation is largely dependent on sound multi-actor institutions and networks to facilitate integration, coordination and implementation of the process, reflected in the support elements of the model (UNEP/GPA, 2006). Glavovic (2006) emphasised that meaningful opportunities for public participation and the establishment of long-term partnerships between government, business, civil society, and the scientific and professional communities are vital for people-centred ICM. Three key support elements were identified for inclusion in the prototype model namely: institutional structures and arrangements, capacity building, and public education and awareness. These are explored in greater detail below.

3.5.1. Institutional structures and arrangements

The implementation of a management model is ultimately driven by people. The most important route to achieving implementation is sound institutional structures that include all relevant actors and that facilitate partnerships and collaboration between different sectors in government, business, civil society, and the scientific and professional communities (Biermann and Pattberg, 2008; Hague and Harrop, 2007; Paavola, 2006). Such institutional structures include *cross-sectoral institutions* (those facilitating collaboration and partnerships between the different sectors in government, business, civil society and the scientific and professional communities) and *multilevel, sector-based institutions* (those facilitating communication of strategies and actions between different tiers of government in a top-down but also a bottom-up fashion within a single sector).

The multi-faceted nature of ICM requires collaboration across sectors and *cross-sectoral institutions*have proven to add significant value to ICM implementation processes (Henocque, 2001; Ostorm et al., 1999; Van Wyk, 2001). It becomes extremely difficult and uneconomical to conduct management of a multitude of different activities within a common pool resource (in this case the coastal marine environment) in isolation from one another because of the potential cumulative or synergistic effects (Ostrom et al., 1999). This is

particularly relevant in the coastal marine environment adjacent to urban centres. In such instances, collaboration is facilitated through cross-sectoral management institutions which foster greater involvement of other actors (e.g. business, civil society, and the scientific and professional communities) that are potentially affected by, or can provide support for, management decisions (DFO, 2002). Not only do such institutions provide a platform for participatory decision-making, for example in setting the common vision and shared resource objectives, but they also act as watchdogs or custodians. Government authorities need to be included in these institutions if they are to have executive powers. However, even in instances where institutions lacked executive powers, they have proven to be effective mechanisms for empowering (and often pressurising) responsible authorities to carry out their legal responsibilities, such as ensuring that licences are issued or that corrective action is taken timeously in instances of non-compliance (Van Wyk, 2001). Sound and easily accessible scientific information, which empowers the authorities and other actors to participate in the decision-making process, is essential to the success of cross-sectoral (multi-actor) institutions (Taljaard et al., 2006a). Cross-sectoral collaboration typically occurs within the various tiers of government and therefore needs to be anchored in a central platform to facilitate integration and coordination within a particular tier. Cross-sectoral collaboration can be facilitated by platforms such as national, provincial or local coastal committees although these, in turn, need to collaborate to strengthen governance across the scales i.e. multilevel governance.

A central purpose of *multilevel institutional structures* is to ensure communication of strategies and actions in a top-down as well as a bottom-up manner within a specific sector, as the various levels or tiers of government have different roles and responsibilities within the management process. For example, at the national level the roles and responsibilities of institutions are usually focussed on the strategic aspects, providing overarching direction, guidance and financial support for implementation (Lau, 2005), while at the local level the roles and responsibilities of institutions are more focussed on 'on-the-ground' implementation. Also, local tiers of government – actively involved in 'on-the-ground' implementation – are ideally positioned to test the effectiveness and applicability of the policies, legislation and best-practice guidelines developed at the national or regional levels. Hence, it is important that local institutions are consulted by higher tiers of government to improve the policy and legal frameworks as part of the adaptive management loop (requiring bottom-up communication).

3.5.2. Capacity building

Cicin-Sain et al. (2000) reviewed capacity-building efforts internationally and consider capacity building in coastal management to include designing and conducting the activities needed to enhance the capacity of organisations and individuals to undertake effective ICM programmes. One of the main social threats to sustainable coastal management, particularly in developing countries, is a lack of or diminishing capacity and expertise, particularly at the local level, with associated ripple effects on the effectiveness and efficiency of management institutions. In addition, government authorities can suffer from a lack of continuity when they are unable to retain sufficient expertise to fulfil their roles and responsibilities (DEAT, 2008). Effective

capacity-building mechanisms form a critical support element in the long-term sustainability of ICM implementation and it is therefore inappropriate to deal with them in an *ad hoc* manner. In the prototype model, capacity building requires a long-term strategy which includes the establishment of partnerships between responsible authorities and training institutions (e.g. universities) aimed at providing a workforce with qualified personnel who are appropriately trained through dedicated environmental management training programmes (Le Tissier et al., 2004). Within government institutions, strategies for skills retention and the deployment of effective mentorship programmes for new recruits are essential.

3.5.3. Public education and awareness

Cicin-Sain and Knecht (1998: 240) aver that "An ICM program cannot survive over the long-term without the support of the general public". The key, they believe, "is a strong…public information and education program" (Cicin-Sain and Knecht, 1998: 240). Thus, another distinct support element in a people-centred approach to environmental management is the active involvement and education of civil society and the creation of awareness and a sense of responsibility for environmental issues among ordinary people.

Initiatives to facilitate public education and awareness may include: physically involving civil society (e.g. beach clean-up – Storrier and McGlashan (2006)); using environmental issues to promote social equity for economically marginalised people through job creation and training opportunities (e.g. Working for Water programme – Van Wilgen et al. (1998)); and public education (often undervalued for its ability to support environmental issues – Sinclair and Diduck (1995)).

3.6. Summary

In essence, the prototype model expands on the more traditional problem/issue-based approaches applied in many earlier ICM models – mostly grounded in the result-based management paradigm (Binnendijk, 2000; Dearden and Kowalski, 2003) – by incorporating elements that support the ecosystem-based management paradigm (Balchand et al. 2007; Moomaw, 1996; UNEP, 2006), the spatial planning paradigm (Agardy, 2010; Halpern et al., 2008; Jentoft and Chuenpagdee, 2009) and the cooperative environmental governance paradigm (Biermann and Pattberg, 2008; Cicin-Sain and Knecht, 1998; Hague and Harrop, 2007; Henocque, 2001; Paavola, 2006; Van Wyk, 2001). These paradigms are also identified in the literature as aspects to consider more seriously in the implementation of ICM (Crowder and Norse, 2008; Norse, 2008; Taljaard, 2011; Taljaard et al., 2011; Weinstein et al., 2007). Thus, the prototype model is developed from traditional ICM by introducing aspects of ecosystem-based management, spatial planning and cooperative environmental governance (e.g. as explicated in support elements involving the different actors relevant to ICM implementation). The model accommodates sector-based management programme silos, typical of a sector-based governance system, by anchoring these in the overarching Resource: Vision, objectives and zoning and the Monitoring and evaluation components of the management cycle as illustrated in Figure 3.

This implies that management programmes, even though largely sector-based, are nested in an ecosystem-based approach, subservient to the agreed requirements and needs of the coastal ecosystem.

4. Empirical Validation: A South African Case Study

The usability of the prototype model and its compatibility with a sector-based governance system is assessed using empirical information deriving from the NPA. Although primarily focussed on the effects of terrestrial activities on coastal waters, the NPA is considered to be a suitable case for empirically testing the usability of the prototype model as it includes a diverse range of activities spanning as many as eight sectors. To assess the compatibility with a sector-based governance system, the extent to which the existing or proposed policies, legislation, institutional structures and other non-governmental actor involvement related to the management of land-based activities could be accommodated (or not) by the prototype ICM implementation model is analysed. The empirical testing is presented by discussing the application within each of the ICM implementation model components and support elements in turn and then synthesising the findings.

4.1. Situation assessment

The situation assessment provides the contextual understanding for implementing integrated (coastal) management of land-based activities. A detailed overview of the situation in South Africa is provided in *South Africa's National Programme of Action for Protection of the Marine Environment from Land-based Activities* (DEAT, 2008). In the empirical testing of the Situation assessment component of the prototype, the problems associated with key land-based activities and the sector-based nature of the legal framework are considered to be as central to understanding the context within which ICM is implemented.

South Africa's coastline is approximately 3 000 km long, with lateral boundaries extending from about one km inland of the high water mark to the outer-boundary of the Exclusive Economic Zone (RSA, 2009). The coastal marine environment is a rich and diverse national asset, providing economic and social opportunities for the human population. Coastal populations utilise coastal resources for food, recreation, commerce and transport. Coastal resources have led to job creation and general economic upliftment e.g. tourism and harbour development. However, the national biodiversity assessment for South Africa conducted in 2004 (Lombard et al., 2004; Turpie, 2004) indicated that few areas within the coastal marine environment were untouched by anthropogenic interference and that the expected trajectory of change could be detrimental for the maintenance of biodiversity. The fifteen key land-based activities that were identified as posing actual or potential threats to the coastal marine environment of South Africa and the associated problems are listed in Table 1.

Table 1. Key land-based activities, as well as potential problems associated with such activities if managed inappropriately

LAND-BASED ACTIVITIES	PROBLEM											
	Siltation	**Modification of streambeds**	**Coastal erosion**	**Destruction of dunes and sandy shores**	**Destruction of coastal habitat**	**Microbial contamination**	**Eutrophication**	**High suspended solids**	**Marine litter**	**Thermal pollution**	**Toxic chemical pollution**	**Alteration of salinity distribution and nutrient supply**
Climate change	●		●	●	●			●				●
Coastal infrastructure development	●	●	●	●	●	●		●				●
Mining	●	●	●	●	●			●			●	●
Freshwater flow modification	●	●	●	●	●			●				●
Municipal wastewater		●				●	●	●	●		●	●
Industrial wastewater						●	●	●		●	●	●
Urban storm water						●	●	●	●		●	
Agricultural practices	●					●	●	●			●	●
Port and harbour operations	●	●	●	●	●	●	●	●	●		●	●
Off-road vehicles			●	●	●							
Solid waste disposal									●		●	
Atmospheric deposition							●				●	
Introduction of alien vegetation					●							
Harvesting of living resources					●							
Aquaculture				●	●	●	●	●			●	

South Africa has an extensive legal framework governing the coastal marine environment including at least 19 international obligations and agreements, 11 national policies ('White papers') and approximately 46 national acts. This is further supported by an array of national regulations, best practice guidelines, as well as numerous provincial acts and local by-laws which are discussed in detail in DEAT (2008). The most recent overviews of the international and national legislation pertaining to South Africa's coastal and marine systems are provided by Glavovic and Cullinan (2009) and McLean and Glazewski (2009), respectively.

Taljaard (2011) demonstrated the complexity and, in particular, the sectoral nature of the legal framework an overview of the national acts related to the management of the coastal marine environment. Apart from the overarching, enabling legislation, such as the Constitution of the Republic of South Africa Act (RSA, 1996) and National Environmental Management Act (NEMA) (RSA, 1998a), legislation is largely *sector-based*, i.e. the various sectors are governed under different acts and by different government departments. Even though the ICMA (RSA, 2009) provides for improved integration of coastal management issues, there are several sectors relevant to coastal management that are managed and controlled through other legislation and an array of government departments. The eight sectors key to ICM implementation are: (i) conservation, (ii) fisheries, (iii) water supply, (iv) waste and wastewater, (v) coastal development, (vi) mining and mineral exploration, (vii) transport (shipping), and (viii) agriculture and forestry. Further, despite a complex and sector-based legal framework, no insurmountable legal barrier to ICM implementation could be identified.

4.2. Resource vision, objectives and zoning

The importance of setting an overarching vision and (resource) objectives for the coastal marine environment is articulated well in South Africa's Coastal Policy (RSA, 2000). At a strategic level the policy supports an ecosystem-based approach to coastal marine environment by setting a common vision and strategic goals and objectives (including ecological social and economic aspects) in a participatory, people-centred manner (Glavovic, 2006). The concept of overarching resource objectives for a resource unit is also recognised in South Africa's National Water Act (NWA) (RSA, 1998b). Sections 13-15 of the NWA require that a Management Class and Resource Quality Objectives be determined for every water resource in the country, including estuaries, and that the suitability and authorisation of any water use within that resource be evaluated against such objectives.

In accordance with the Coastal Policy, South Africa's primary legislation pertaining to coastal management – the ICMA – recognises the importance of the delineation of geographical boundaries for the national coastal management unit and explicitly demarcates the national boundaries of the coastal marine environment (RSA, 2009). Although the ICMA is less explicit in terms of the specification of geographical boundaries for smaller coastal management units, for example at the bioregional, provincial or local scales, it allows for the demarcation of special management areas (or units) provided that "…environmental, cultural or socio-economic conditions in that area require the introduction of measures which are necessary in order to more effectively – (a) attain the objectives of any coastal management programme in the area; (b) facilitate the management of coastal resources by a local community; (c) promote sustainable livelihoods for a local community; or (d) conserve, protect or enhance coastal ecosystems and biodiversity in the area" (RSA, 2009: 40). Furthermore, the ICM Act allows for the establishment of a coastal planning scheme, defined as "a scheme that facilitates the attainment of coastal management objectives by – (a) defining areas within the coastal zone or coastal management area which may – (i) be used exclusively or mainly for specified purposes or activities; (ii) not be used for specified purposes or activities; and (b) prohibiting or restricting activities or uses of areas that do not comply with the rules of the scheme." (RSA 2009: 40). The concept of zoning and associated resource objectives for the coastal marine environment is also supported in other national legislation. For example, the Biodiversity Act (RSA, 2004a) and the National Environmental Management: Protected Areas Act (RSA, 2004b) allow for the demarcation of protected areas in coastal waters to protect biodiversity. The Marine Living Resource Act (RSA, 1998c) allows for the demarcation of protected areas aimed at protecting the country's aquatic living resources and ensures stock recovery. South Africa's operational policy for the disposal of land-derived wastewater to the marine environment, a best practice guide for marine disposal, also adopted the concept of 'zoning' as part of its implementation framework (Taljaard et al., 2006b). However, despite the enabling legislation and best practices, the concept of spatial planning or zoning within the coastal marine environment (i.e. areas seaward of the high water mark) has not been fully embedded in the country's national spatial development processes (e.g. National Spatial Development Perspective, Provincial Growth and Development Strategies and, at the local level, the Integrated Development Plans and Spatial Development Framework). Demarcation of management units

and zoning at the local scale has been applied in an *ad hoc* manner as exemplified in the Saldanha Bay case (Taljaard et al., 2006b). Here the rationale for designating the local coastal management unit boundaries, in this case the embayment including Saldanha Bay and the Langebaan Lagoon, was that fluxes within the coastal ecosystem were considered greater than fluxes between the coastal ecosystem and adjacent land and oceanic systems (Taljaard et al., 2006b; Taljaard and Monteiro, 2002). In consultation with local managers, use areas within the embayment were mapped using a geographical information system. This map facilitated the identification of potentially conflicting uses by visualising the overlapping of the harbour and port zones with the mussel/oyster farming zones.

In principle, therefore, the Coastal Policy, ICMA and several other pieces of environmental legislation, support the notion of an overarching vision and objectives for the coastal marine environment of South Africa, as well as the concept of spatial planning (i.e. demarcation of management units and use zoning), as is proposed in the prototype ICM implementation model. However, the practice of incorporating spatial planning and zoning of the coastal marine environment in the existing spatial planning processes, particularly at the local level, is not yet common in South Africa.

4.3 Management programmes

Over the past 15 years, South Africa's efforts to protect its natural environment, including the coastal marine environment, have focused on the development of sound environmental policies (white papers) and legislation (acts). Much of the legislation and many of the policies are sector-based. Whilst the problem of (sectoral) fragmentation is often cited as a major challenge in environmental management, in a review of environmental governance in South Africa Müller (2009) argued that this may be a misperception. In Müller's view capacity constraints and ineffective enforcement of legislation pose much greater challenges to environmental management in South Africa, a concern dating from the mid-1990s. However, South Africa's legal and governing system, albeit strongly sector-based, recognises the importance of sound environmental management programmes.

The prototype ICM implementation model is designed to accommodate a sector-based governing system by placing the implementation of Management programmes (which are viewed as remaining largely sector-based) between the Resource: Vision, objectives and zoning and the Monitoring and evaluation components. This is intended to ensure that management programmes are grounded in an ecosystem-based approach, and remain subordinate to the requirements and needs of the coastal ecosystem (Figure 3). Three subcomponents were included in the management programmes, namely the identification of key sectors for which management programmes should be provided, the setting of management strategies and actions for the various sectors and the prioritisation of management programmes and actions for operationalisation.

The key sectors and activities for which management programmes should be provided are identified as the eight sectors relevant to ICM in the situation assessment and the fifteen land-based activities which were identified in the NPA as key threats or potential threats to the coastal marine environment in South Africa. Each of the land-based activities is categorised as relevant to a particular sector, apart from climate change which is cross-cutting. Following the identification of the key sectors and activities for management, the degree to which management strategies and actions have been determined needs to be established. To this end, the following questions were asked for each of the 15 activities:

- Is formal legislation in place to mandate the management and control of the activity?
- Are regulations and/or best practice guidelines available to guide effective operationalisation?
- Are the necessary human, material and financial resources available and are they used in effective execution and enforcement?
- Are compliance monitoring programmes undertaken?

Answers were provided by scientists from the CSIR and were verified by the National Advisory Forum through consultative meetings and document review (DEAT, 2008). The results of the investigation of the management strategies and actions (Table 2) indicate that the legislation necessary to mandate the management and control of thirteen land-based activities and their effects on the coastal marine environment is in place (10 rated as good, 2 as fair), but is lacking for climate change and urban stormwater. The situation is worse in terms of regulations and best practices where only urban wastewater, industrial wastewater and off-road vehicles are adequately covered. Indeed, as we move from the overarching legal and regulatory framework, to nested management strategies and actions and to compliance monitoring the situation worsens with only the urban wastewater and industrial wastewater deemed to be adequately managed and controlled. This indicates that there is a lack of capacity to implement and enforce existing legislation and to plan and execute project-based management actions. The shortcomings in the management programmes linked to individual sectors and activities provide a detailed status overview (Table 2) and are useful in the prioritisation of future actions, as required in the prototype model.

4.4. Monitoring and evaluation

Monitoring and evaluation are embedded in South African environmental legislation. For example, NEMA requires all levels of government to submit annual reports on progress in terms of sustainable environmental development practices (RSA, 1998a). One of the avenues through which this is achieved is the State of Environment Reporting, at the national, provincial and local levels. Programmes that specifically relate to the coast include the State of the Coast and State of Estuaries programmes (DEA, 2011).

Table 2. The status of management programmes related to the fifteen land-based activities identified in the NPA as potentially posing a threat to the coastal marine environment of South Africa (● = good; ● = fair; • = poor; Two symbols, e.g. ●/•, imply that in a significant proportion of the country achievement of this management objective is "good", while still in a "poor" state in other areas)

KEY SECTOR	ACTIVITY	MANAGEMENT STRATEGIES AND ACTIONS			
		LEGISLATION	REGULATIONS / BEST PRACTISE	MANAGEMENT STRATEGIES & ACTIONS	COMPLIANCE MONITORING
Cross-cutting (i.e. different sectors need to consider responses to climate change, where appropriate)	Climate change	•	•	•	•
Coastal development	Coastal infrastructure development	●	●	●/•	•
	Off-road vehicles	●	●	●/●	●
Exploration and mining	Mining	●	●	●/•	●/•
Water supply	Freshwater abstraction and flow modification	●	●	•	•
Waste and wastewater	Municipal wastewater	●	●	●/•	●/•
	Industrial wastewater	●	●	●/•	●/•
	Urban storm water	•	•	•	•
	Solid waste disposal (littering)	●	●	●/•	●/•
	Atmospheric deposition	●	•	•	•
Agriculture and forestry	Agricultural practices	●	•	•	•
Transport (shipping)	Port and harbour operations (including dredging)	●	●	●	●
Conservation	Introduction of alien vegetation	●	●	●/•	●/•
Fisheries	Harvesting of living resources (relating to habitat destruction)	●	•	•	•
	Aquaculture (relating to habitat destruction and pollution)	●	●	•	•

In South Africa NEMA is the central piece of legislation enforcing the long-term monitoring and evaluation programmes in the coastal marine environment required by the prototype model. The SoE reporting programmes, together with data collection and management initiatives supported by the South African Environmental Observation Network (SAEON, 2011), the South African Data Centre for Oceanography (SADCO, 2011) and others, therefore, provide a knowledge and learning basis for effective implementation. However, the various initiatives need to be aligned and coordinated so as to develop a long-term, sustainable and comprehensive monitoring and evaluation programme for both the achievement of actions and outputs (implementation monitoring), as well as for the achievements of outcomes and goals (results monitoring).

4.5. Support elements

In the prototype model three support elements (representing elements of the 'cooperative environmental governance' paradigm and revolving around the organisation and involvement of *actors,* were distinguished, namely: institutional structures and arrangements; capacity building; and public education and awareness. The compatibility of existing governance structures in coastal marine management in South Africa with each of these support elements is analysed.

4.5.1. Institutional structures and arrangements

The institutional structures and arrangements for coastal marine management in South Africa are largely sector-based, with the responsible government departments to a greater or lesser degree establishing in-house systems for sector management (Taljaard, 2011). The prototype model allows for sector-based management in ICM implementation, but requires cross-sectoral, multi-actor institutions for integration and coordination amongst the sectors. This consideration is recognised in South African legislation (e.g. NEMA) and is supported in practice through the establishment of cross-sectoral institutions such as the Committee for Environmental Coordination, Committees of Ministers and Members of Executive Councils (institutions created to promote executive intergovernmental relations) and the Ministerial Technical Committee (an institutional structure set up to facilitate coordination between the national department responsible for the environment and provincial environment departments) (Malan, 2005). In addition, provincial coastal working groups have been established to facilitate the coordination of coastal management issues between provincial government departments and other non-governmental organisations (e.g. community-based organisations, NGOs, research organisations, and recreational and user groups) with varying degrees of success. In terms of setting up cross-sectoral, multi-actor institutions for coastal marine management, the ICMA holds great promise. The Act, promulgated in 2008, now mandates the establishment of multi-level and cross-sectoral coastal management institutions aimed at facilitating ICM (i.e. the national, provincial and municipal coastal committees) (RSA, 2009) (Figure 4), although these structures are still in the process of being established. Furthermore, these institutional structures also need to link, as conceptually illustrated in Figure 4, with multi-national (intergovernmental) institutions such as the Benguela Current Commission (Benguela Current Commission, 2010) operational along South Africa's west coast.

The important role of local institutional structures has also been recognised by civil society as manifested in numerous (*ad hoc*) local forums which had been established along the coast (DEAT, 2008). These local institutions reflect a network mode of governance (Müller, 2009). However, it is envisaged that under the ICMA, some of these institutions may also incorporate hierarchical modes of governance (Müller, 2009) and may migrate towards municipal coastal committees, for instance, as proposed under the Act. One of the most successful local institutions is the Saldanha Bay Water Quality Forum Trust, a voluntary actor network comprising officials from local, regional and national authorities, representatives from all major industries in the area and other groups who have a common interest in the area (Taljaard, 2006b; Van Wyk, 2001; Vreugdenhil et al., 2009).

4.5.2. Capacity building programmes

Capacity building and skills development are major concerns in South Africa, also insofar as they affect competent management of the coastal marine environment. The national department responsible for science and technology, in collaboration with the South African National Research Foundation (NRF), has created programmes aimed at enhancing the skills and competencies of unemployed graduates and postgraduates in science, engineering and technology. Training and capacity building form the core of the functions of the International Ocean Institute Southern Africa (IOI-SA, 2011) which offers short courses in several aspects of marine and coastal management. The capacity building support element is a priority of the government at present. However, dedicated, long-term development programmes specifically aimed at improved governance of the coastal marine environment do not exist and are required.

4.5.3. Public participation and awareness

The importance of *public participation and awareness* as a support element in the management of the coastal marine environment has long been recognised in South Africa as reflected in the establishment of programmes such as Coastwatch, the Blue Flag Campaign and Working for the Coast (WESSA, 2011a, 2011b, Müller, 2009). Coastwatch was established in the province of KwaZulu-Natal under the auspices of the Wildlife and Environment Society of South Africa (WESSA, 2011a). Environmental education and information is central to South Africa's Blue Flag campaign (WESSA, 2011b), an international initiative that encourages municipalities to provide clean and safe beaches for local populations and tourists (FEE, 2006, 2011). The national department responsible for the environment launched the Working for the Coast Project, a project that provides jobs and training for unemployed people in coastal communities to create and maintain a cleaner and safer coastal environment – an example of a market mode of governance (Müller, 2009). Further, South Africa takes part in the International Coastal Cleanup campaign involving large numbers of public participants through a series of regional initiatives (Ocean Conservancy, 2011). These programmes have contributed significantly to creating public awareness and responsibility for coastal issues, manifesting the importance of this support element in effective people-centred ICM, as required in the prototype model.

In summary, even though the ICMA (RSA, 2009) provides for improved integration of coastal management issues, there are several sectors relevant to coastal management that are managed and controlled through a complexity of other legislation and an array of government departments. However, no insurmountable legal barrier to ICM implementation could be identified. Further, the Coastal Policy, ICMA and several other pieces of environmental legislation, support the concept of an overarching vision and objectives for the coastal marine environment of South Africa, as well as the concept of spatial planning (i.e. demarcation of management units and use zoning), as required by the prototype ICM implementation model. More importantly, however, the practice of incorporating spatial planning and zoning of the coastal marine environment in the existing spatial planning processes, particularly at the local level, is not yet common in South Africa. Indeed, in analysing the situation with regard to management programmes it became clear that that there is a lack of capacity to implement and enforce existing legislation and to plan and execute project-based management actions within the sectors and activities. Only in the case of urban and industrial wastewater can the management strategies and actions as well as compliance monitoring be deemed well managed. The shortcomings identified in the sector-based management programmes, however, provide useful information in prioritising future actions as required by the prototype model. In the monitoring and evaluation component of the management cycle, it is the coordination and alignment that fall short. Similarly, the supporting elements are well established, although the practical working of cross-cutting institutions also require enhancement. Programmes to advance public participation and awareness have contributed significantly to creating public awareness and responsibility for coastal issues in South Africa (e.g. WESSA, 2011a, 2011b, Ocean Conservancy, 2011), an essential element in effective people-centred ICM, as required in the prototype ICM implementation model. Clearly, approaches to coastal management in South Africa, grounded in the current sector-based statutory framework, are compatible with the approach to ICM implementation proposed in the prototype model. The identified shortcomings in coastal management are caused by the lack of, and inefficiencies, in the operationalisation of existing legislation, and do not arise from an inherent conflict between the prototype model and the existing governance system in South Africa.

5. Conclusion

The prototype ICM implementation model presented in this paper expands on the traditional problem, or issue-based approaches applied in earlier ICM implementation models, which are grounded in the result-based management paradigm. The prototype model includes elements of the ecosystem-based management, the spatial planning and the cooperative environmental governance paradigms identified in the literature as aspects to consider more seriously in the implementation of ICM (Taljaard et al., 2011). The prototype model anchors the sector-based management programmes that are typical of sector-based governance systems within the overarching resource vision, objectives and zoning and the monitoring and evaluation components of the management cycle. This means that the management programmes, even though largely sector-based, remain grounded in an ecosystem-based approach, subject to the agreed requirements and needs of the

coastal ecosystem. Thus the prototype model represents a crafting of aspects from traditional ICM with aspects of ecosystem-based management and spatial planning as well as the concept of support elements involving various actors in ICM implementation (cooperative environmental governance).

An empirical validation of the prototype ICM implementation model was undertaken in South Africa. Findings indicate that approaches to coastal management in South Africa, grounded in the current sector-based statutory framework, are compatible and can be aligned with the approach to ICM implementation as proposed in the prototype model. Non-alignment with the prototype model does not arise from inherent conflict between the model and the existing governance system but rather a lack of, and inefficiencies, in the operationalisation of existing legislation. Based on this empirical test and the fact that the model was designed to accommodate sector-based management programmes, it is argued that the prototype model is potentially compatible with sectors and activities other than those presented in the case study, such as conservation, transportation (shipping) and fisheries. Indeed, the prototype model is currently being tested in selected South African estuaries (CSIR, 2009), examples of management units within the coastal marine environment.

Further, based on the generic nature of the prototype model and the degree of compatibility found in the empirical test, the ICM implementation model presented in this study is proposed as a potentially suitable model for countries with coastal management milieus similar to South Africa, that is extensive existing legislation and numerous initiatives supporting ICM already in existence, but governed under a largely sector-based system. Clearly, further empirical testing of the prototype model is required to establish the degree to which this claim is valid. Additionally, although the exposition in this paper gives confidence in the usability of the prototype model in a sector-based governance system, the testing of the prototype model against theoretically derived criteria forms a necessary next step in firmly establishing its scientific credibility and wider applicability.

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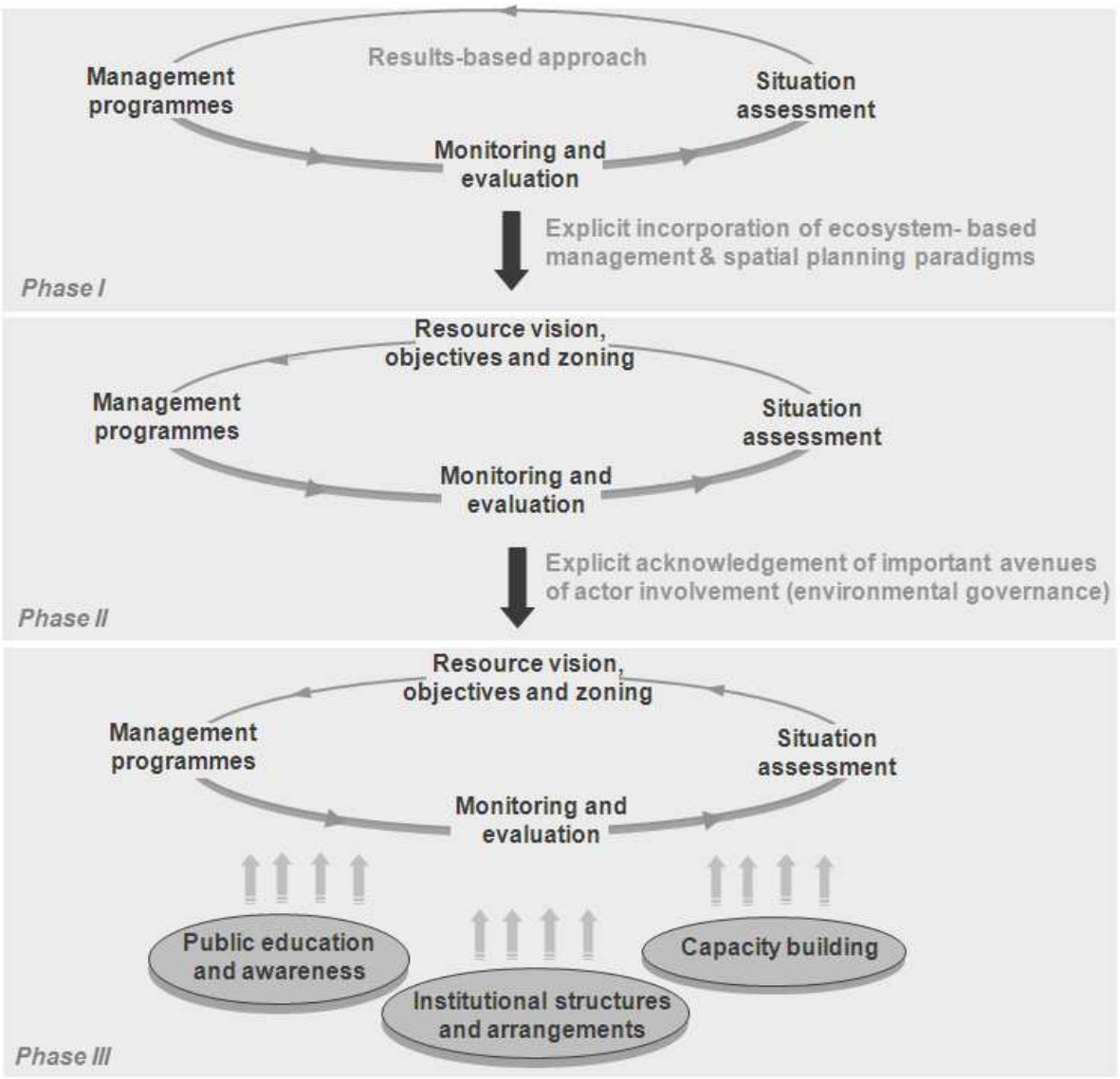

Figure 1. Evolution of the prototype implementation model for ICM in South Africa with modifications reflected as differences from one phase of the design process to the next

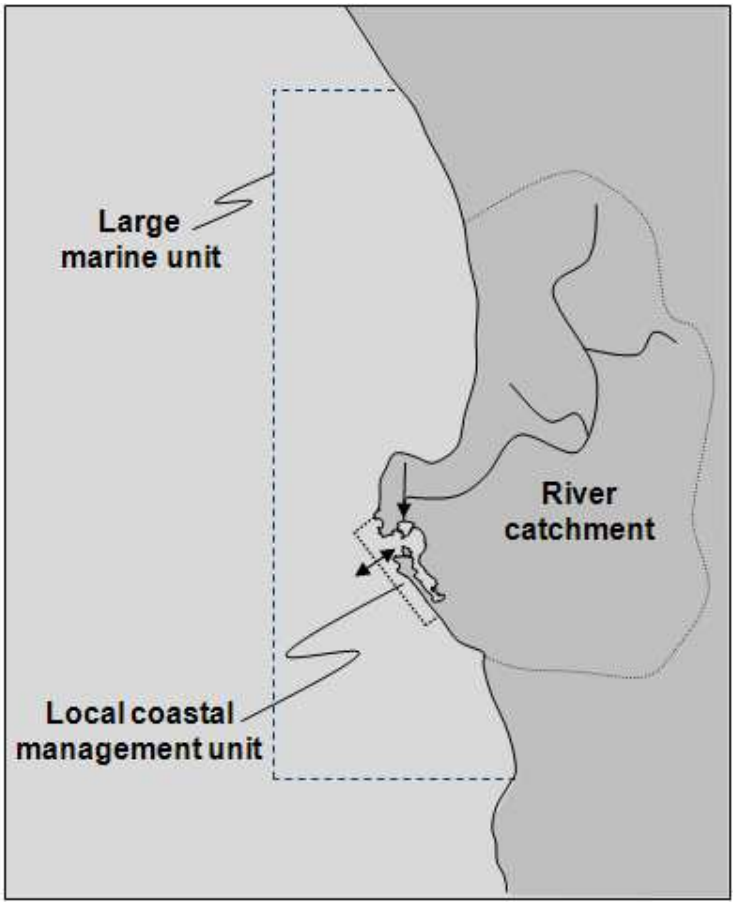

Figure 2. Conceptual illustration of a local coastal management unit and its links to adjacent riverine and marine environments

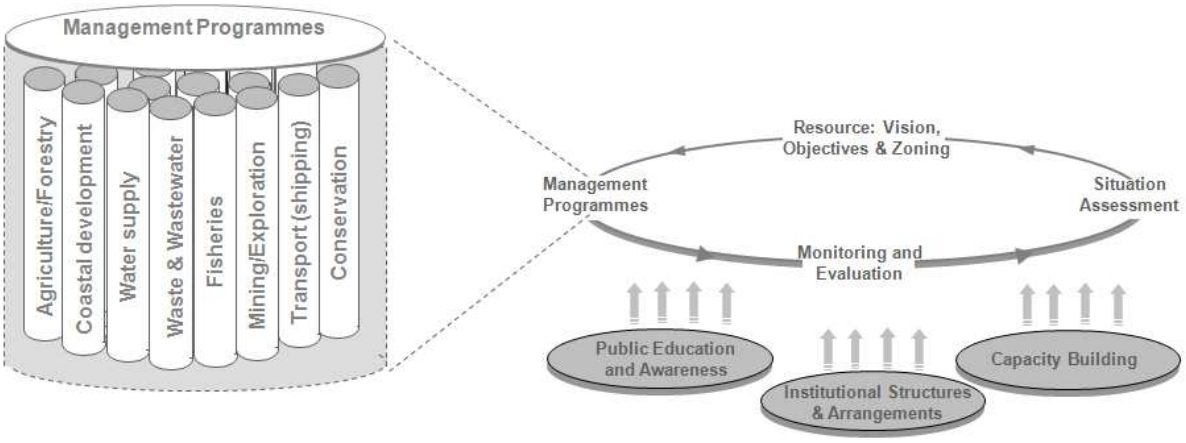

Figure 3. Incorporating sector-based management into an implementation model for ICM

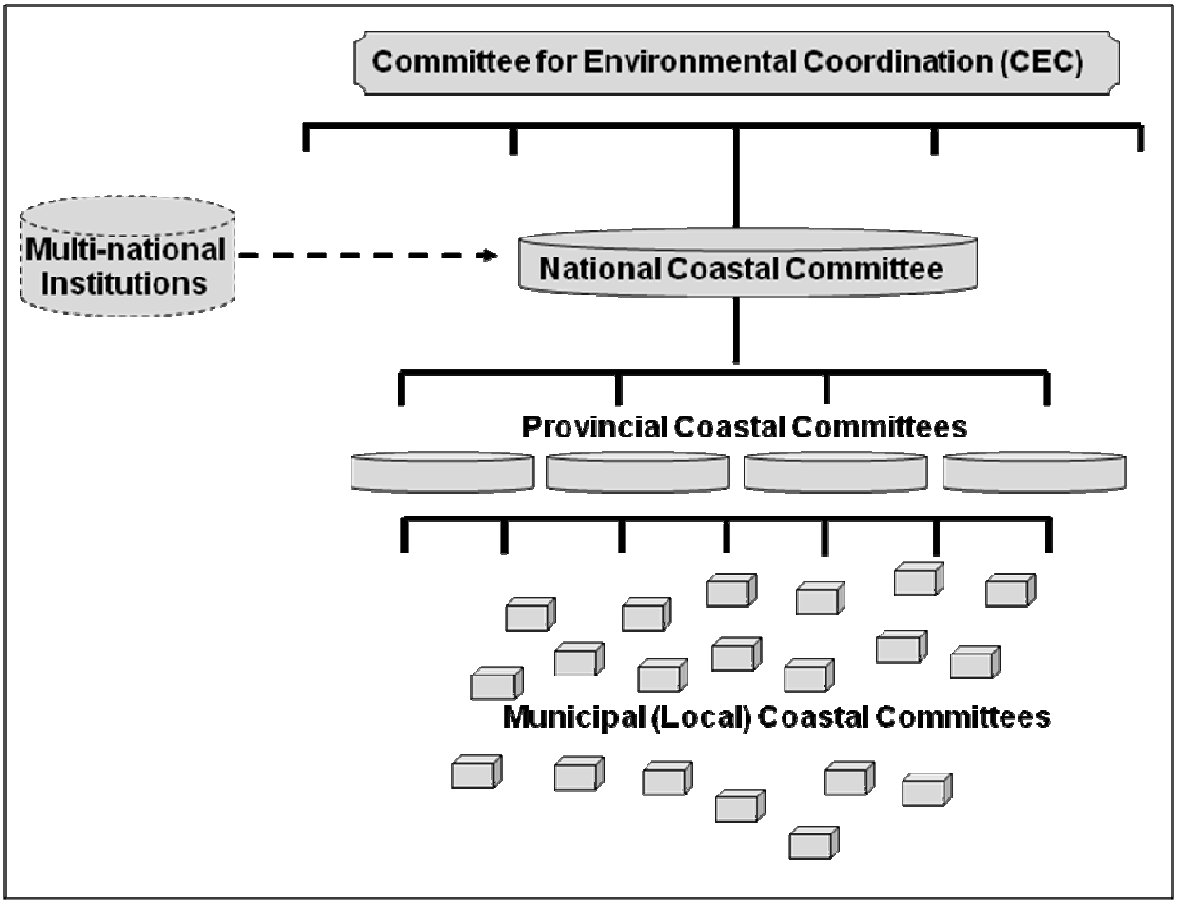

Figure 4. Institutional structures for coastal management stipulated in existing South African legislation