Towards the Conservation and Sustainable Use of Eastern Cape Estuaries

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Water Research Commission

Towards the Conservation and Sustainable Use of Eastern Cape Estuaries

Report to the Water Research Commmission
by

Charles Breen, Janine Adams, Allan Batchelor, Paul Cowley, Gary Marneweck, Lesley McGwynne, Margaret McKenzie, Patrick Ngulube, Angus Paterson, Nhlanhla Sihlophe, Susan Taljaard, Jane Turpie, Amanda Uys, Lara van Niekerk and Aidan Wood

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PREFACE

The Eastern Cape Estuaries Management Research Sub-programme is one of four Sub-programmes of the Eastern Cape Estuaries Management Programme that was initiated in mid 1998. The main purpose of the Eastern Cape Estuaries Management Programme is to promote the effective management and sustainable use of Eastern Cape estuaries. In total the programme has four sub-programmes:

- Local Estuary Management
- Estuary Management Institutional and Policy Development
- Estuary Management Capacity Building
- Estuary Management Research

The fourth component, this Research Sub-Programme, has been kindly sponsored by the Water Research Commission. This report is the first volume of the three-volume report presenting the products of the Sub-Programme . The first volume provides an overview of the outcomes of the seven research projects that make up Volume II:

- Project A: Governance
- Project B: Co-management
- Project C: Sustainable Use
- Project D: Biodiversity Protection
- Project E: Monitoring
- Project F: Rehabilitation
- Project G: Knowledge Management

The third volume consists of supplementary reports that were produced by the researchers of the seven projects during the course of their investigations.

The intended readership of the three volumes are:

- Volume I: Those who would like to read an overview of the outcomes of the research projects
- Volume II: Those who would like to read the details of each research project as well as their recommendations
- Volume III: Those who would like to read the supplementary reports that support the project reports.

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EXECUTIVE SUMMARY

Research programme context

The spatial dimensions of estuaries and their location on the coast are such that most individual estuaries are contained within the boundaries of a single coastal municipality. Few straddle two municipalities and even fewer are contained within formally protected areas. Local government therefore, has the most direct relationship with estuaries, and local people benefit most from the goods and services that derive from these complex natural assets. From a legal and development perspective, this relationship is established by the Municipal Systems Act of 2000 that requires all municipalities to implement integrated development planning in ways that promote participation of civil society and connect vertically and laterally within and between other tiers of government. Integration has particular significance for estuaries because their structure and functioning are strongly determined by what happens in distant parts of the catchment and in the sea.

Since democracy was established in South Africa, there has been a strong emphasis on promoting the participation of civil society in governance and in managing the use of natural resources. The legal foundation for this is reflected in the South African Constitution and Acts that have followed. This has brought new challenges for government, civil society and for researchers whose contribution is increasingly measured as growth in understanding leading to social benefits that can be sustained in the longer term.

Acknowledging this context, the challenges posed to researchers in this programme were to better understand the needs of society, to develop the scientific basis for management and to promote informed co-operative governance and management of the use of estuary resources.

Research programme aims

The overall aim of the Research Sub-programme was to promote management of the use of estuaries that is based on scientific understanding. A stakeholder strategic needs analysis workshop was used to identify those issues that needed scientific investigation. Issues were prioritised by participants and then transformed into eight research aims that would each be addressed by a project. These were:

- Co-operative governance systems should be appropriate, easily understood and can be implemented
- Co-operative management systems (including integrated planning) should be appropriate, easily understood and able to be implemented
- Guidelines for a strategy for the protection of the national heritage of estuary biodiversity should be adopted by appropriate authorities
- Protocols for defining levels of sustainable use should be adopted by appropriate authorities
- Protocols for monitoring estuaries to promote compliance with policies and legislation at whatever level should be appropriate, and adopted by appropriate authorities
- Protocols for the rehabilitation of estuaries should be adopted by appropriate authorities
- A sustainable knowledge management system should be constructed, implemented and used
- A self-sustaining capacity building programme should be constructed and implemented

Research Outcomes

During the course of the research a number of reports were produced. This report is the first of three volumes that present the final outcomes of the Sub-programme. A detailed guide to where to find information is captured in the table below:

Research project	**Location**
Overview of outcomes	***Volume I***
Co-operative Governance	**Project Report A, Volume II**
Protocol for estuary management	Section 2.1, Project Report A, Volume II
Co-operative governance systems	Section 2.2, Project Report A, Volume II
Detailed overview of estuary management protocol	Supplementary Report 2, Project A, Volume III
Detailed comments of estuary legislation and policy	Supplementary Report 2, Project A, Volume III
Co-management	**Project Report B, Volume II**
Co-management system	Section 2, Project Report B, Volume II
Institutional arrangements for local estuary management	Supplementary Report 1, Project B, Volume III
Co-management lessons learnt	Supplementary Report 3, Project B, Volume III
Sustainable Use of Living Resources	**Project Report C, Volume II**
Procedure for achieving sustainable use	Section 3, Project Report C, Volume II
Current status of exploitation of living resources	Supplementary Report 3, Project C, Volume III
Snapshot surveys of selected estuaries	Supplementary Report 4, Project C, Volume III
Survey of fishery utilisation of four estuaries	Supplementary Report 5, Project C, Volume III
Socio-economics of recreational and subsistence use	Supplementary Report 6, Project C, Volume III
Biodiversity Protection	**Project Report D, Volume II**
Biodiversity protection strategy	Section 4, Project Report D, Volume II
State of biodiversity protection	Supplementary Report 1, Project D, Volume III
State of estuary health	Supplementary Report 1, Project D, Volume III
International strategies for conservation of biodiversity	Supplementary Report 2, Project D, Volume III
Monitoring	**Project Report E, Volume II**
Monitoring protocol	Section 3, Project Report E, Volume II
Generic set of indicators for estuaries	Appendix A, Project Report E, Volume II
Interpretative framework for generic indicators	Appendix C, Project Report E, Volume II
Rehabilitation	**Project Report F, Volume II**
Protocol for rehabilitation	Section 4, Project Report F, Volume II
Tools for rehabilitation	Section 5, Project Report F, Volume II
Knowledge Management	**Project Report G, Volume II**
Knowledge management recommendations	Section 8, Project Report G, Volume II
Knowledge auditing model	Supplementary Report 1, Project G, Volume III
Knowledge sharing Eastern Cape estuaries	Supplementary Report 2, Project G, Volume III

Research findings

The research findings indicate that whilst policies, legislation and the will may exist to promote co-operative governance and management, this is frustrated by confusion about the roles of local government and civil society. More particularly it is frustrated by the absence of formal delegation of responsibility. There is a need for strategic guidance from national and provincial departments with regard to estuarine management. It is shown that coastal municipalities are likely to be pivotal in achieving the intentions of national and provincial policies. Their authority needs to be clearly defined and delegation must be formalised so that they are able to incorporate estuary issues into the integrated development planning process and be duly held accountable. The research has contributed to improved understanding of the causes and remedies for slow progress in achieving effective co-operative governance and management.

Protocols were developed for five issues: sustainable use, biodiversity, monitoring, rehabilitation and knowledge management. Their linkage to the Integrated Development Planning (IDP) process was shown. The Adaptive Management Process was used to create commonality of design so that the protocols can connect with one another.

The research aims were expressed as outcomes. As it turned out, however, the lack of clarity of which agency has *de jure* responsibility for planning and management at estuary level made this aim unattainable. A recommendation is made as to whom this agency should be, and a second phase for the research programme that would facilitate incorporation of estuary planning and management into the IDP process is proposed.

Conclusions and recommendations

- The physical scale of estuaries and their location within coastal municipalities, indicates a central role for these authorities at the interface between governance and on site management. The authority for this role is established by the Municipal Systems Act that requires municipalities to prepare, maintain and implement integrated development planning. It is concluded that municipalities have, in general, experienced difficulties with the preparation of IDPs and that capacity will have to be improved to achieve their potential to manage the use of estuaries. By and large municipalities are the *de facto* managers for estuary development and use. They need also to be constituted as the *de jure* managers.
- It is **recommended** that the role of municipalities in promoting co-operative governance and management as it relates to estuaries that are not situated within formally protected areas, be defined; that responsibilities for appropriate aspects of management be delegated; and that the arrangements be formalised by way of Agreements so that accountability is acknowledged.
- One of the purposes of co-operative governance is to deliver integrated development. As municipalities are required to establish structures and processes that promote integration on a local scale, these structures and processes can be used cost effectively and efficiently to promote the intentions of co-operative governance and management as they relate to estuaries. Municipalities are already linked upwards and outwards.

- It is **recommended** that the Integrated Development Planning Department within coastal municipalities act as the Centre responsible for promoting co-operative governance and management of estuaries at municipal level.
- There is no national framework for estuary management or strategic guidance from national and provincial departments with regards to estuary management.
- It is **recommended** that municipalities be provided with strategic guidance from national/provincial departments with regard to local estuary management. Strategic documentation should incorporate the co-operative vision and management objectives of leading national departments to avoid sectoral conflict at a local level.
- It is concluded that success in estuary management depends on progress across many fronts including national, provincial and local government, and within civil society. This research indicates that progress at local government level may be lagging behind that at national and provincial levels.
- It is **recommended** that more effort be focused at a local level to stimulate participation in estuary management in support of national and provincial initiatives.
- Co-operation in governance and management can be effective only when civil society is organised to engage in these processes in a structured, informed and responsible manner.
- It is **recommended** that Estuary Management Forums be constituted and that their roles and responsibilities be formalised by way of Agreements between the Municipal Department/Centre (see above) and the Forum. The intentions of the Agreements are to mobilise civil society in support of shared goals and to promote accountability for self-regulation by constituencies represented on the Forum.
- Over-exploitation is shown to be one of the principal threats to sustaining the flow benefits to society from estuaries.
- It is **recommended** that the Rapid Assessment Matrix approach be adopted and applied as a co-operative approach between Municipalities and Estuary Management Forums to develop and implement strategies for managing the consumptive use of estuary resources.
- A national strategy for the conservation of estuarine biodiversity does not exist, despite this being a requirement for meeting national policies and the terms of international agreements. The very few estuaries that are contained within formally conserved areas are inadequate for conservation of estuarine biodiversity. Municipalities, through the requirement for integrated development planning, require guidance that would be afforded by such a national strategy.
- It is **recommended** that urgent attention be given to developing a national strategy for the conservation of estuarine biodiversity and that it be incorporated into the integrated development planning procedures at municipal level as soon as possible.
- The integrated development planning process is iterative, each cycle starting with analysis. At present estuary monitoring is not organised to deliver systematically into this adaptive learning process that promotes continual improvement. Consequently, the mechanism does not exist to efficiently and effectively mobilise resources in the public and private sectors in support of monitoring.
- It is **recommended** that the monitoring protocol developed in this programme be incorporated into the procedures used by municipalities to monitor progress with integrated development planning.

- The ability of estuaries to continuously deliver a diverse stream of benefits to society is threatened by actions that have a direct effect and by those that exert influences indirectly. The latter commonly arise distant from the estuary as in the case of upstream abstraction of water. Rehabilitation is commonly required to re-instate desired conditions. As these conditions have to reflect the shared vision of stakeholders, the rehabilitation process needs to be connected with the integrated development planning process and the monitoring process and should itself be an iterative, adaptive, learning process.
- It is **recommended** that the rehabilitation protocol developed in this programme be incorporated into the procedures used by municipalities when analysis in planning indicates the need for rehabilitation.
- Co-operation in governance and management cannot occur when there are wide disparities in understanding and knowledge. Existing structures and procedures are not effective in achieving a more equitable distribution of knowledge. Indeed the knowledge gap may be increasing.
- It is **recommended** that the municipal department charged with responsibility for integrated development planning, be established as a Centre that promotes the dissemination of data and information and acts with the relevant Estuary Management Forums to foster knowledge sharing, capacity building and empowering participation in governance and management.
- In light of the above conclusions and recommendations, it is further **recommended** that a second phase of this research programme be supported with the specific intention of incorporating estuary management into integrated development planning, and building the this capacity in selected case studies.

1 OVERVIEW OF THE RESEARCH SUB - PROGRAMME

1.1 Introduction

Estuaries are distinct places and as such provide a strong focus for the activities of society. These activities bring direct and indirect social, economic and environmental benefit to the extent that estuaries are valuable assets in coastal economies. Not surprisingly, attention is being increasingly focused on how to promote management of the use of the goods and services of estuaries in ways that offer prospects for sustainability in the long term. How to do this is the central question addressed in the three volumes of this report in which we consider two particular issues: how should management be organized and operate; and what are some of the matters that it should address. These issues were identified and prioritised at a workshop for managers and stakeholders held in Port Elizabeth on February 22, 2000.

Globally, there is growing appreciation for the need to harness the wisdom, energy and skills of all stakeholders in the management of the use of natural resources. As the relative scarcity of estuary goods and services increases so too does the imperative for achieving equity, efficiency and sustainability in their use. The era of 'command and control' governance is being replaced by a participatory form of governance and we have much to learn about how to build 'upwards and across' from the local to the global (Isar, 1998).

The South African government is actively promoting co-operative governance and participatory management and the Municipal Systems Act of 2000 provides very specifically for Integrated Development Planning (IDP) at the local scale. This has to integrate laterally and vertically with the structures and functions provided for in other Acts. Prominent among these is the National Environmental Management Act (NEMA) of 1998, the National Water Act (NWA) of 1998, the Marine Living Resources Act (MLRA) of 1998 and the White Paper on Sustainable Coastal Development of 2000. A compelling question is how one organizes and operates so that one can deliver according to the requirements of these policies and legislation and according to the reasonable expectations of users of estuary goods and services? The dynamic social process that guides and regulates the relationships among social actors can be termed governance and management can be termed the implementation of measures to achieve the intentions arrived at through the process of governance.

Whilst policy and legislation act to direct effort to co-operative governance and co-operative management, there are other drivers that direct effort to learning more about selected issues. For example, being signatory to international conventions such as the Convention on Biological Diversity, the Ramsar Convention and to Local Agenda 21 brings responsibilities for an informed management. Since there is continuous change, particularly in South Africa, management has to be continually informed through a process of learning and adapting.

The system is complex and dynamic. It is driven by top down, bottom up and lateral forces. It is characterised by statutory and non-statutory bodies and a host of constituencies with differing needs and expectations that change continually. Not surprisingly the system is also characterised by tensions between and within the domains of citizen constituencies and the state. One has to

accept and embrace this complexity as a normal part of one's reality. This requires that not only must one understand complexity and seek ways to engage it holistically, but one must also strive for the behavioural change that is necessary to inculcate a culture of co-operation among actors.

As a complex system, the parts are interactive and outcomes are difficult and often impossible to predict, particularly when the system changes continuously. Faced with such complexity one is tempted to reduce the complexity with which one has to deal. Whilst it may be desirable and necessary to operate or learn about one sector, the challenge is always to maintain the linkages with other sectors. For this reason, we adopted a systems approach to the design and operation of the research programme and projects.

1.2 Frameworks for the Research Sub-programme

Governance and management are processes and if they are to proceed in an orderly fashion and be understood by stakeholders, they should be conceptualised, structured and implemented by means of frameworks or mental models as Senge (1990) terms them. The advantages of using mental models to depict how a system is structured and works are that assumptions (hypotheses) are made explicit and are therefore amenable to testing and correction as learning provides improved insight. In essence, frameworks facilitate dialogue among stakeholders and learning for adaptive governance and management. As systems thinking (Senge, 1990) formed the philosophical foundation for the design and implementation of this Eastern Cape Estuaries Management Research Sub-programme and individual projects, the deliverables are mostly in the form of generic frameworks and specific protocols for incorporating matters such as rehabilitation, into adaptive management. Each of these is conceptualised and structured to facilitate cross linkages by way of a core framework.

1.2.1 Research Sub-programme framework

The framework that was used to guide the development and implementation of the Research Sub-programme is shown in Figure 1. This cyclical process requires managers and users to engage with each other in the definition of management needs and that once these have been identified, they have to be transformed into research briefs that serve to guide researchers in the design and implementation of research projects. The framework requires that research findings be transformed into deliverables that are readily applied in management. In this programme the deliverables were in the form of frameworks and protocols.

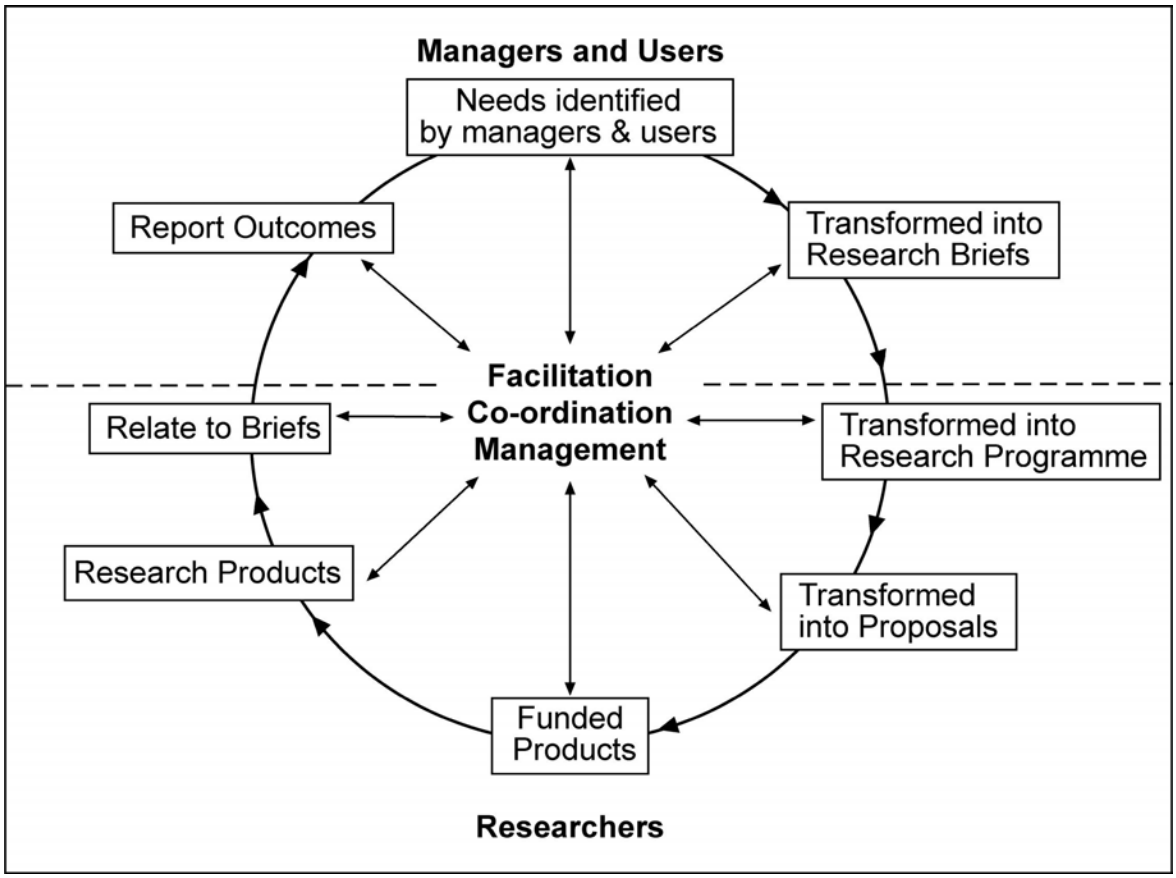

Figure 1: Framework used to guide the development and implementation of the Research Programme.

A strategic needs analysis workshop was held in Port Elizabeth on 22 February 2000 and a report is available from the Institute of Natural Resources. Fourteen needs were identified, namely to:

- Integrate estuary management into development planning
- Develop guidelines for and promote estuary rehabilitation
- Create awareness, build capacity and motivation
- Develop guidelines for sustainable use (consumptive and non-consumptive) of estuary resources
- Develop and implement a national estuary information and communication system
- Include estuaries in the national strategy for protected areas
- Develop a national estuaries monitoring system
- Meet estuary fresh water requirements
- Identify and designate certain estuaries as Ramsar sites
- Apply Integrated Environmental Management (IEM) plan
- Learn from case studies
- Ensure water quality standards
- Understand the marine-estuary relationship
- Fast track co-operative governance.

1.3 Research Sub-programme aims

The overall aim of the Research Sub-programme was to promote management of the use of estuaries that is based on scientific understanding. The stakeholder strategic needs analysis workshop was used to identify those issues that needed scientific investigation. Issues were prioritised by participants and then transformed into eight research aims that would each be addressed by a project. These aims were:

- Co-operative governance systems are appropriate, easily understood and can be implemented
- Co-operative management systems (including integrated planning) are appropriate, easily understood and can be implemented
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- Protocols for defining levels of sustainable use are adopted by appropriate authorities
- Protocols for monitoring estuaries to promote compliance with policies and legislation at whatever level is appropriate, are adopted by appropriate authorities
- Protocols for the rehabilitation of estuaries are adopted by appropriate authorities
- A sustainable knowledge management system is constructed, implemented and used
- A self-sustaining capacity building programme is constructed and implemented.

The last aim cuts across all projects and was therefore, not set up as a separate project. Capacity building aspects of the Programme are discussed in a section towards the end of the report. A research brief was drawn up for each of the other seven aims and in due course the projects were awarded to successful bidders.

1.3.1 The search for a common process

The intention of the Research Sub-programme was twofold: to suggest a system that would help establish co-operative governance and co-operative management of estuaries and to show how research on specific issues could be connected to such a system. The distinction between governance and management is fundamental because it separates the policy and legislative domain from the management domain. The search was for a system that could bridge these domains in ways that promote co-operation and learning at the physical scale of an estuary. The system had therefore to be iterative, adaptive, participatory and supportive of integration: vertically from constituencies in civil society through local, district and provincial government to national government; and horizontally at the various levels. It had to provide guidance for both structure and process.

The South African Constitution establishes that local government is in charge of the development process in municipalities. By and large the physical scale of an estuary is such that it is, in most instances, situated within a municipality so that coastal municipalities are the development authorities for estuaries and their surrounds. It follows that the process used by municipalities should be central to whatever system is established to promote sustainable use through co-operative governance and management. The intention of government expressed particularly in the Municipal Systems Act No 32 of 2000, is that Integrated Development Planning (IDP) (Figure 2, page 11) is the mechanism for achieving this. It is appropriate because the IDP is a continuous participatory process of decision making about the use of available resources that integrates economic, sectoral, spatial, social,

institutional, environmental and fiscal strategies in order to support the optimal allocation and use of scarce resources (Table 1, page 12). The intention is to promote sustainable growth, equity and the empowerment of, among others, the poor and the marginalized. This suggests the IDP as a logical choice for the common process to provide the core to which other processes can be connected.

Integrated development planning as perceived in the Act, does not address project implementation. There is, however, an implied assumption that management will adopt an adaptive approach that conforms with the adaptive learning approach implicit in IDP. In essence what is envisaged is two adaptive learning cycles: one founded in regulation (policy and legislation) and planning;; and the other in project management. For the purposes of this report these two participatory processes are distinguished as co-operative governance and co-operative management.

With this in mind, the research programme was structured into two parts:

- Part one comprising two projects that addressed the structure and processes of co-operative governance and management respectively
- Part two comprising five projects that addressed how to better inform the operation of these processes in respect of:
    1. Sustainable use of living resources
    2. Monitoring
    3. Rehabilitation
    4. Protection of biodiversity
    5. Knowledge management.

The findings of each of these projects are reported in Volume II. Here we provide an overview of each project in the context of its relationships to IDP.

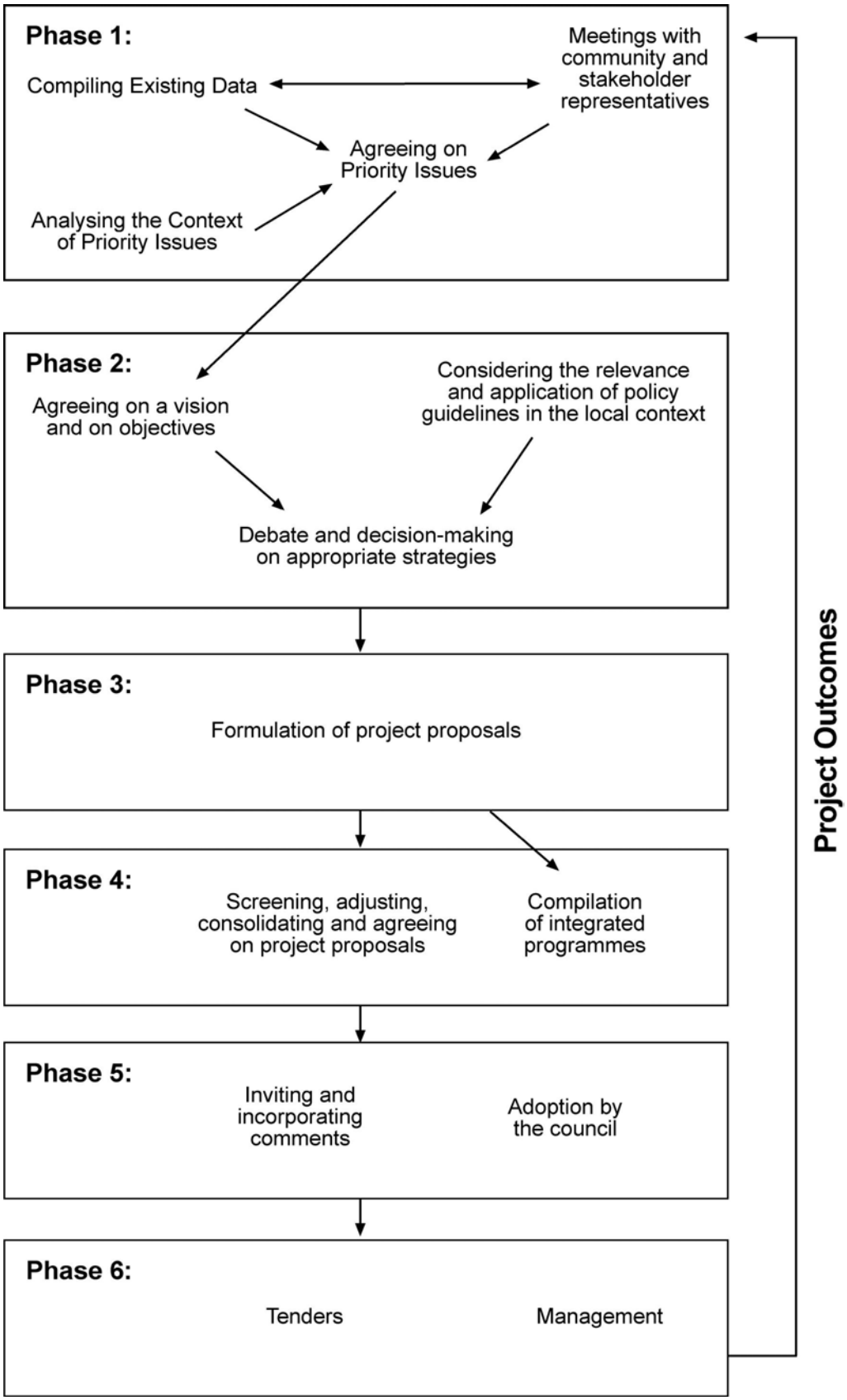

Figure 2: Overview of the integrated development planning process. Implementation and project management are not addressed specifically. Project outcomes feed back into analysis. Source: Modified from KwaZulu-Natal Department of Agriculture and Environmental Affairs, 2003.

Table 1: The roles and responsibilities of different spheres of Government in the integrated development planning process (Roles and responsibilities outside the realm of the IDP process are excluded). This illustrates both vertical and horizontal integration. Source: KwaZulu-Natal Department of Agriculture and Environmental Affairs, 2003.

SPHERE OF GOVERNMENT	ROLES AND RESPONSIBILITIES
Local Government	To: • Prepare an IDP • Adopt an IDP • Provide support to poorly capacitated municipalities • Facilitate the compilation of a framework which ensures co-ordination and alignment between local municipalities and the district municipality
Provincial Government	To: • Co-ordinate training • Provide financial support • Provide general IDP guidance • Monitor the process in the province • Facilitate co-ordination and the alignment between district municipalities • Facilitate alignment of IDPs with sector department policies and programmes • Assess IDPs • Provide relevant information on sector department's policies, programmes and budgets • Contribute sector expertise and technical knowledge to the formulation of municipal IDPs in the allocation of resources at the local level
National Government	To: • Issue legislation and policy in support of IDPs • Issue Integrated Development Planning Guidelines • Provide financial assistance • Provide a national training framework • Establish a Planning and Implementation Management Support System • Provide relevant information on sector department's policies, programmes and budgets • Contribute sector expertise and technical knowledge to the formulation of municipal policies and strategies • Be guided by municipal IDPs in the allocation of resources at the local level.

2 RESEARCH FINDINGS

2.1 Part one: Governance and management

Co-operation is not a matter of personal choice, it is a requirement of the South African Constitution. The extent to which this can be achieved is dependent to some considerable degree on the softening of structural, functional and behavioural boundaries within and between agencies of government and civil society. Whether structures and processes work effectively is ultimately dependent on whether people are committed to making them work. Thus consideration must be given to structure, process and behavioural culture.

2.1.1 Governance

The overall goal of this project was to promote effective co-operative governance of estuaries by developing a legal and institutional framework that would have general application in South Africa. The focus was on statutory provisions for co-operative governance, taking into account current principles, policy, legislation, regulations and practice. Because of the diverse interests, roles and responsibilities of statutory bodies, the perceived need was to first develop a national protocol that would assist with defining responsibilities and co-ordination particularly among the lead agencies in a structured manner.

At the outset the project team engaged the lead agencies, facilitating the co-evolution of a national protocol (Volume II, Report A). The proposed protocol (Figure 3, page14) illustrates an iterative process of developing a shared vision and objectives, formulating strategies, planning operations, monitoring an assessment and evaluation. The protocol conforms closely to that for integrated development planning in that the thrust in both processes is strategic. Thereafter, the statutory framework for co-operative governance, as well as the state and private sector actors that should participate in the process was described using the proposed protocol as a basis (Volume II, Report A). These actors and their responsibilities vary with each tier of government (Local, Provincial and National) and each step in the process. Guidance is provided for determining who is responsible, what the legal mandate is, who should participate and who should be kept informed.

The envisaged legal and institutional structure for implementing integrative co-operative governance in estuaries, in context of the proposed protocol, is shown in Figure 4 (page16). At national scale the lead agents (Department of Environmental Affairs and Tourism and the Department of Water Affairs and Forestry), under the auspices of the Committee for Environmental Co-ordination (established under the National Environmental Act), would have responsibility for the process.

This committee would inform and be informed by national government departments and at provincial level by Coastal Committees established under the Coastal Zone Bill and by Estuary Advisory Groups. The Coastal Committees would also inform and be informed by Catchment Management Agencies, established under the National Water Act. At the level of Local Government, interaction would be with the municipal integrated development structure and planning process established under the Municipal Systems Act, with Water User Associations established under the National Water Act and with civil society through Estuary Forums.

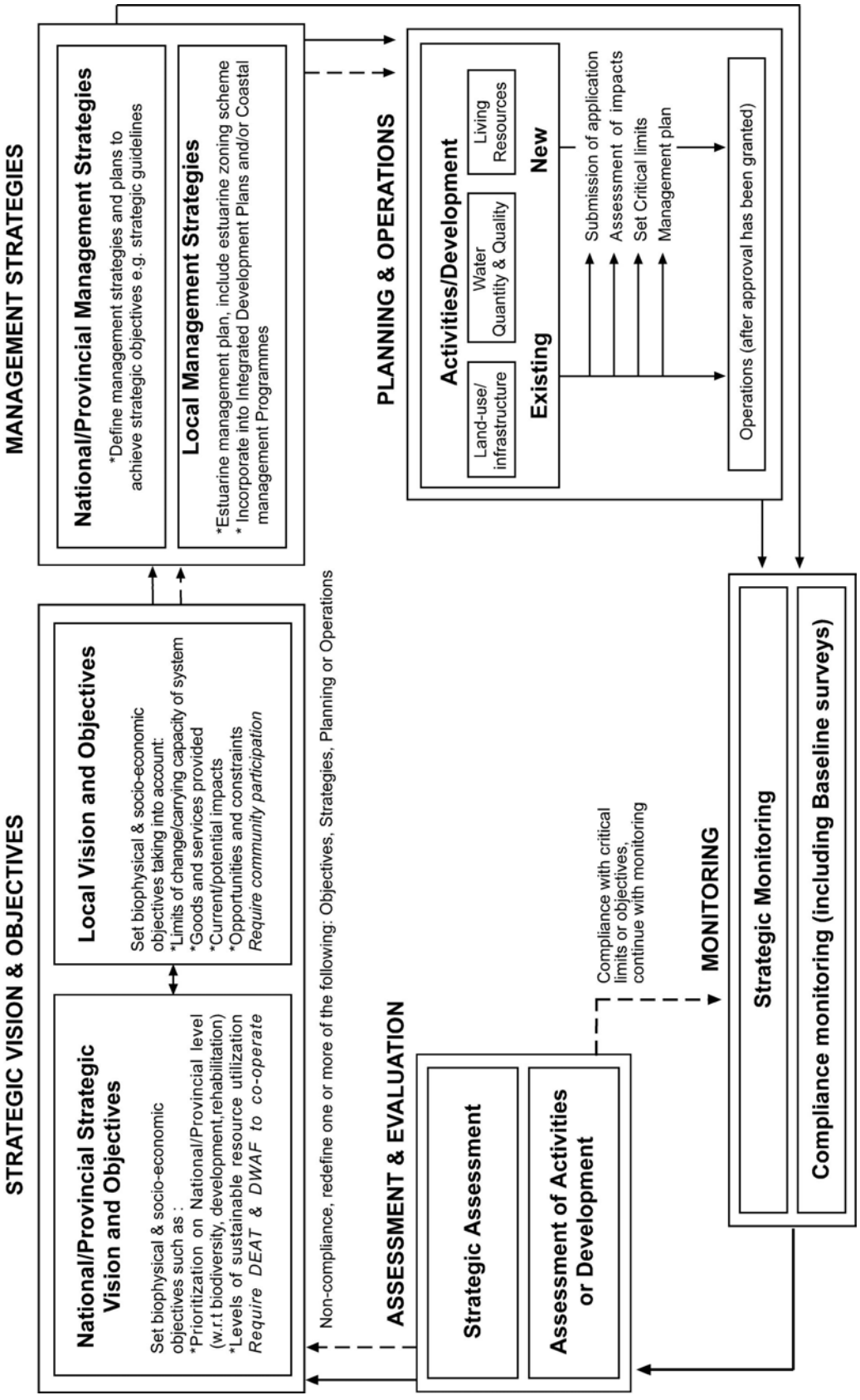

Figure 3: Proposed National Management Protocol for South Africa's estuaries. This protocol incorporates the principles and procedures of adaptive management.

2.1.2 Management

The overall goal of this project was to develop a co-operative management system. Since co-operation has to occur between and within state departments and civil society it is clear that whatever system was developed, it had to accord with those established in law and in government practice. Government has expressed its intentions in the various Acts referred to above, to devolve responsibility with accountability and so it is also necessary that the system addresses how this is to be achieved. Thus, the system proposed comprises three parts: structure, process and behaviour.

The spatial dimensions of estuaries are such that most estuaries occur within the boundaries of municipalities to whom the responsibility of development has been delegated in terms of the Municipal Systems Act. From a management perspective therefore, municipalities are perceived as playing the central role that is continually shaped by local circumstances and by the policy and legislative processes occurring at provincial and national levels. For this to happen in a continuous and dynamic way as envisaged by government, it is necessary to formalise the linkages between the statutory policy and legislative processes that are largely independent of physical scale, with site-based planning and management of implementation. Distinction must be drawn between the strategic processes of planning and the tactical processes of management. The IDP process is envisaged as a co-operative strategic process whereas implementation of projects on site may be, but are not always, co-operative involving various actors drawn from either or both government and civil society.

The proposed co-management system is shown in Figure 5 (page 17). It is envisaged that connection between the statutory policy and legislative process with the site-based management process is effected through formal Co-operation Agreements at a strategic planning level and at an implementation level. Institutionally, the parties to these agreements would be those who participate in the IDP process. At the strategic planning level, the various levels of government and the statutory bodies established by them have particular relevance for the constitution of Estuary Management Forums (Level 1 Agreements, Figure 5, page 17).

Those who engage in management actions such as monitoring, rehabilitation or self-regulation by constituencies such as local recreational fisher organisations and conservation organisations would formalise their relationships, responsibilities and accountabilities by way of Level 2 Agreements (Figure 5, page 17). These Agreements are seen to serve four purposes: promote effective delegation (responsibility with accountability), promote co-operation, to promote empowerment for participation (skills, opportunities and enhanced self-confidence), and promote adaptive management that directs actions towards equity, efficiency and sustainability. Because behaviour is central to achieving and sustaining co-operation, it is recommended that Agreements would also incorporate principles of conduct (Table 2, page 16).

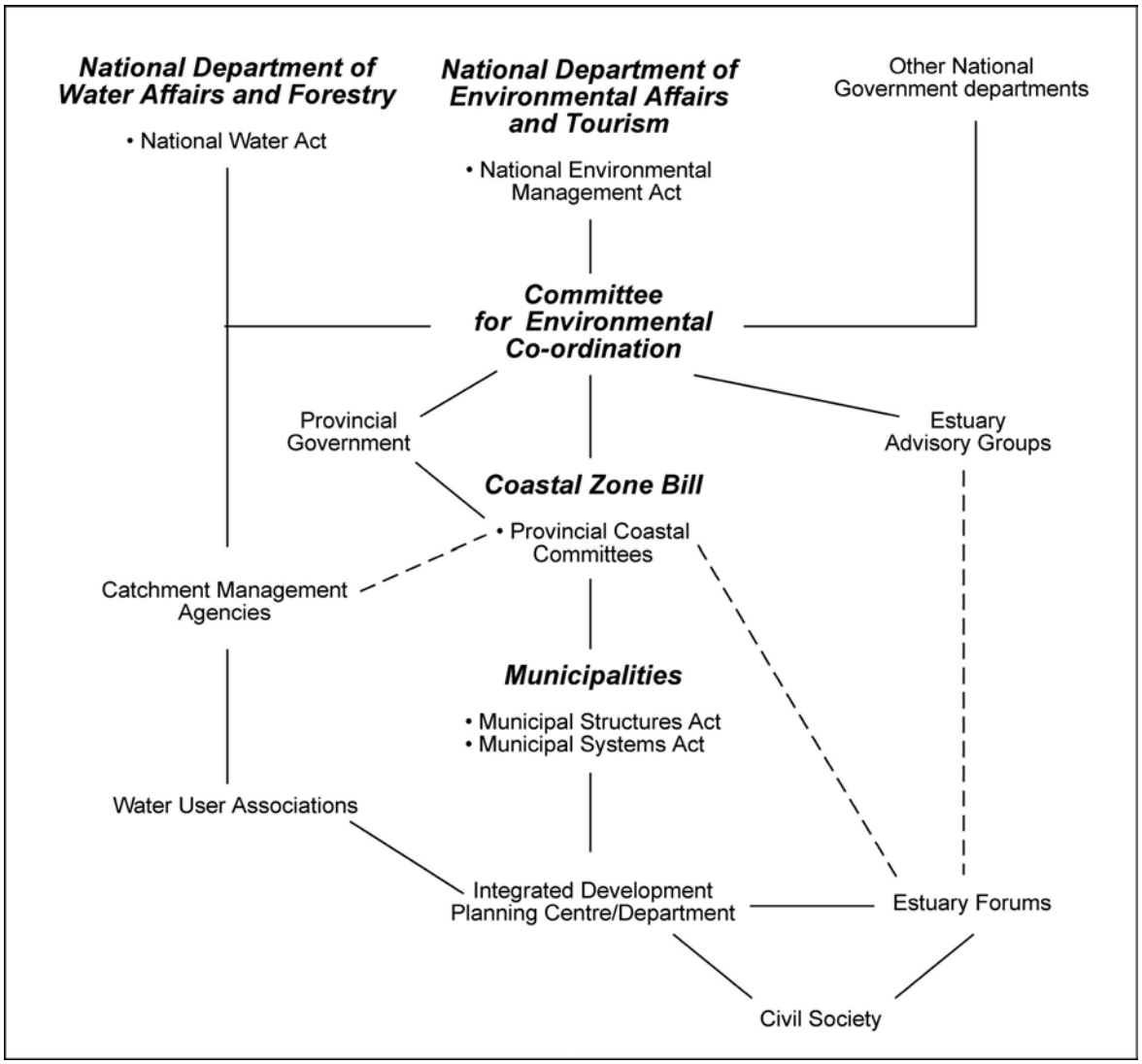

Figure 4: The structure proposed for integrating governance as it relates to estuaries.

Table 2: Principles recommended for incorporation into Level 1 and Level 2 Co-operation Agreements as indicated in Figure 5. These principles are required to align behaviour with the intention of co-operative management. Refer to Volume II, Report B for definitions.

Accountability	Accepting responsibility for one's action
Transparency	Full, open and timely disclosure of information
Honesty	Sincerity with respect to actions
Responsibility	Disciplined performance of assigned tasks
Compliance	Actions must accord with provisions of policies, legislation and procedures
Recognition	Acknowledgement of validity or governance of a contributor or contribution
Empathy	Comprehending and adopting an approach that acknowledges the needs of others
Equity	Fairness and recource to justice
Representing interests of constituency	Balancing own constituency interests with common goals

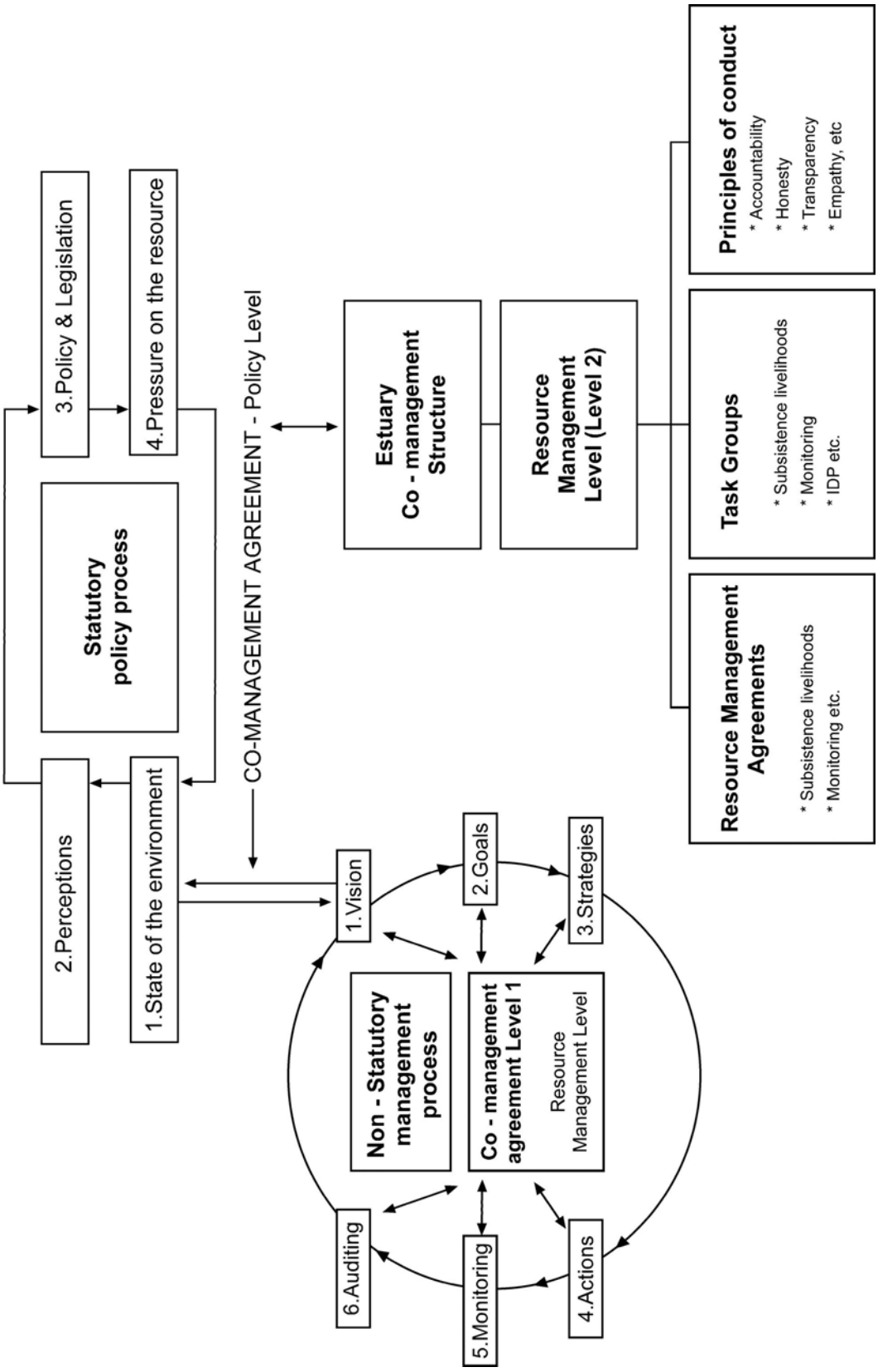

Figure 5: The adaptive policy and management processes showing the interface position of the co-management structures (Estuary Management Forums) and the agreements that formalise delegation of roles responsibilities.

2.2 Part two: Protocols for priority issues

2.2.1 Sustainable use

The goal of this project was to develop a set of guidelines to support management for the sustainable exploitation of living resources in Eastern Cape estuaries. As the intention was to provide generic guidelines and not guidelines for particular estuaries, the approach was to develop a management rather than ecologically oriented classification system. Managers would be able to classify any estuary of concern and then determine the relevant guidelines.

As the term 'sustainable use' implies, the over-riding intention of management is to establish patterns of use that can be sustained. Since these vary among users, it was necessary to define categories of users. The Marine Living Resources Act in seeking to promote equitable access to the use of the resources, recognises three categories of users: Recreational, Subsistence and Licensed commercial. Whilst this broad classification is helpful, it is not detailed enough to assist managers when dealing with the diverse and dynamic nature of the people who use estuary resources. The classification was refined to include Part-time and Full-time Subsistence users and five categories of Recreational users, namely: Competition, Relaxation and Adventure, Food consumption, Sham recreational fishers (those who pose as recreational fishers but who seek to catch as many fish as possible), and Trophy hunters targeting mostly large specimens.

Estuaries vary widely in the nature, levels and availability of goods and services and this is determined to a significant degree by the state of the estuary mouth. Of the 210 estuaries in the Eastern Cape, 143 were included in this study because they are regarded in ecological terms, as 'functional estuaries'. Of these some are considered to have permanently 'open' mouths and others as 'closed' because the mouth is at least temporarily closed. Using a combination of mouth condition and predominant form of exploitation, estuaries were classified into nine classes (Table 3, page 19) with varying levels of confidence reflecting availability of information.

Issues affecting sustainable use were categorised by stakeholders into Environmental, Socio-economic and Institutional issues that were then used to develop appropriate guidelines for management.

Table 3: A classification system relating estuary mouth state and nature of use.

1. Open - Recreational (OR)	Permanently open system whose living resources (fish and invert) are predominantly (>60%) targeted by recreational (shore and boat) anglers and bait collectors.
2. Open - Subsistence (OS)	Permanently open system whose living resources (fish and invert) are predominantly (>60%) targeted by subsistence anglers and/or bait collectors.
3. Open - Mixed User (OM)	Permanently open system whose living resources (fish and invert) are targeted by both subsistence and recreational users, with neither group predominating the overall effort. Systems where one group of anglers (e.g. recreational) predominate and the other group of bait collectors (e.g. subsistence) predominate are also classed as OM.
4. Closed - Recreational (CR)	Temporarily open/closed system whose living resources (fish and invert) are predominantly (>60%) targeted by recreational (shore and boat) anglers and bait collectors.
5. Closed - Subsistence (CS)	Temporarily open/closed system whose living resources (fish and invert) are predominantly (>60%) targeted by subsistence anglers and/or bait collectors.
6. Closed – Mixed User (CM)	Temporarily open/closed system whose living resources (fish and invert) are targeted by both subsistence and recreational users, with neither group predominating the overall effort. Systems where one group of anglers (e.g. recreational) predominate and the other group of bait collectors (e.g. subsistence) predominate are also classed as OM.
7. Closed - Unused (CU)	Temporarily open/closed system whose living resources are not exploited by any user group.
8. Open - Unused (OU)	Permanently open system whose living resources are not exploited by any user group.
9. Protected	Any estuary which enjoys total or a degree of protection from exploitation of it's natural resources, e.g. those within the boundaries of the Tsitsikamma National Park.

Actions were identified and recommended for each of the following management domains:

- Resource, 10 management actions
- Ecosystem, 8 management actions
- Socio-economic, 13 management actions
- Institutional, 18 management actions.

Acknowledging the difficulties experienced in securing the required resources to apply these guidelines at every estuary, a Rapid Assessment Matrix was developed to provide an indication of the current sustainability situation so that management actions can be prioritised. This rating system utilises mostly subjective information relating to the following categories ranked in order of priority as perceived by stakeholders:

1. Consumptive use
2. Shallow water habitats
3. Population density
4. Illegal activities and Conservation value
5. Water abstraction
6. Enforcement patrols

7. User conflict
8. Recreational disturbance.

Since the importance attached to these issues varied widely, a weighting system using the top three categories was developed.

Application of the Rapid Assessment Rating Matrix was tested for eleven estuaries in the Ndlambe Municipality.

The findings of this project have relevance for the IDP process (Figure 1, page 8) in that they provide a system to structure analysis so that strategies can be developed and actions prioritised. The system also promotes an integrated approach directed at sustainable use. More detailed information is available in Volume II, Report C.

2.2.2 Biodiversity protection

The overall goal of this project was to produce guidelines for a strategy for the protection of biodiversity, particularly in the estuaries of the Eastern Cape. The approach was to first develop a platform for these guidelines by reviewing the current status and effectiveness of biodiversity protection and of the health of Eastern Cape estuaries.

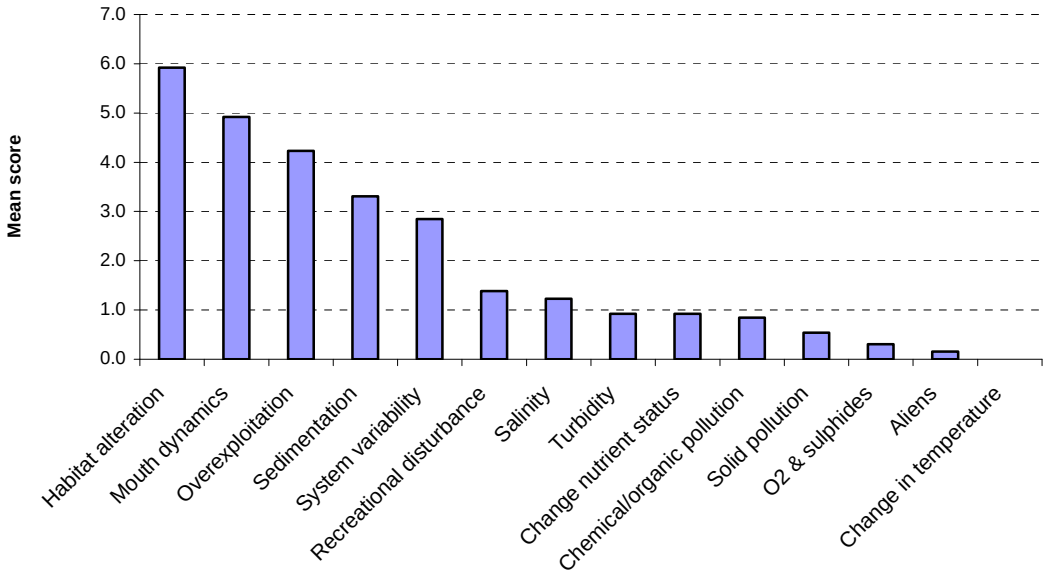

Figure 6: Rank score of each of the named threats, calculated from individual rankings by 15 workshop participants.

Researchers and managers familiar with estuaries in the Eastern Cape participated in a workshop to determine the threats to biodiversity. Distinction is drawn between proximate (direct) threats to biodiversity and ultimate (indirect) threats. Ultimate threats are the actions that take place which cause the proximate threats. Fourteen proximate threats were identified and were interpreted in terms of prevalence and severity. They were then ranked according to subjective interpretation of current overall threat to biodiversity (Figure 6, page 20).

Eight ultimate threats to biodiversity were identified using causal chain analysis:

- Overexploitation, primarily as a result of recreational demand facilitated by ease of gaining access, inadequate enforcement, inappropriate regulation systems and planning and to some extent, because of poverty
- Recreational disturbance reflecting planning that is not sufficiently environmentally sensitive and does not adequately incorporate the socio-economic value of environmental resources
- Habitat alteration / loss consequent upon consumptive and non-consumptive utilisation, erosion caused by boat traffic, implementation of development plans and, to a lesser degree invasion by alien species
- Alien invasive species introduced during mariculture and in water transfers, including ballast water, competing with indigenous species
- Pollution, mainly deriving from urban and industrial developments and reflecting inappropriate planning
- Biochemical characteristics and estuary mouth dynamics change as the quality, quantity and timing of water reaching the estuary changes with increasing use upstream. In part this is consequent upon market failure because water pricing does not reflect the true value of the resource
- Sedimentation / siltation rates are perceived to increase as more material eroded from land surfaces is deposited in the estuary and as flow is unable to scour terrestrial and marine sediments out to sea
- System variability is generally reduced by purposeful management, because decisions are made with inadequate appreciation for the value of estuary goods and services to society as a whole.

These threats to biodiversity can be linked to growing populations placing ever increasing demands on natural resources and operating in an environment of inadequate planning, enforcement and compliance. Even within 'protected areas' protection of biodiversity is inadequate. In part this reflects policy deficiencies in that desired levels of biodiversity protection have yet to be set and these are required before setting biodiversity conservation goals and strategies.

International experience indicates that the most fundamental pitfall in achieving biodiversity protection is allowing responsibility for estuary **management** to be fragmented amongst different national, provincial and local government agencies. The intention of the Municipal Systems Act is that municipalities be responsible for development in their areas of jurisdiction. This being so, it would be appropriate that responsibility for estuary management be delegated to this level and municipalities are held accountable for estuary management within the context of the policy and legislative processes at national and provincial levels. Thus, national goals and strategies have to be developed to guide those formulated and implemented at lower levels of governance (Refer to Figures 1 and 2, pages 8 and 11).

Proposed goals for Eastern Cape, but probably also having wider relevance, are to:

- Maintain/restore the ecological **integrity** of estuaries, by ensuring that the ecological interactions among estuaries and those between estuaries, their catchments and other ecosystems are maintained.
- Maintain/restore the **health** of estuaries in/to a good to excellent condition, assuring that a representative set of estuaries is maintained in as close to their pristine state as possible. This includes (for all estuaries):
  - Maintenance of the natural magnitude, variability and frequency of **natural physical processes** within estuaries
  - Maintenance of the natural characteristics and variability of estuarine **populations and communities** in terms of size, structure and functioning, through sustainable utilisation
  - Maintenance of the natural **taxonomic diversity** of all estuaries, without loss of indigenous taxa from any estuary other than by natural processes, and without the introduction of alien species.

At present there is no strategy for protecting estuarine biodiversity in South Africa (although steps are being taken to address this) and strategy development is complicated by the complex interrelationships between policies and legislation within and across spheres of government. Ideally a strategy should have both regulatory and incentive-based components that reinforce each other. Five elements are considered necessary. These are elaborated in the project report in Volume II, Report D:

- Regulation and enforcement. Estuaries should be categorised in terms of regulations. Figure 7 (page 22) provides a visual overview of the three recommended categories: Estuarine Protected Areas, Estuarine Conservation Areas and Estuarine Management Areas
- Conditions and incentives. Elements of this component of the strategy are shown in Figure 8 (page 23)
- Monitoring and adaptive management
- Research and knowledge management
- Rehabilitation.

The last three of these were addressed in projects that formed part of the research reported here.

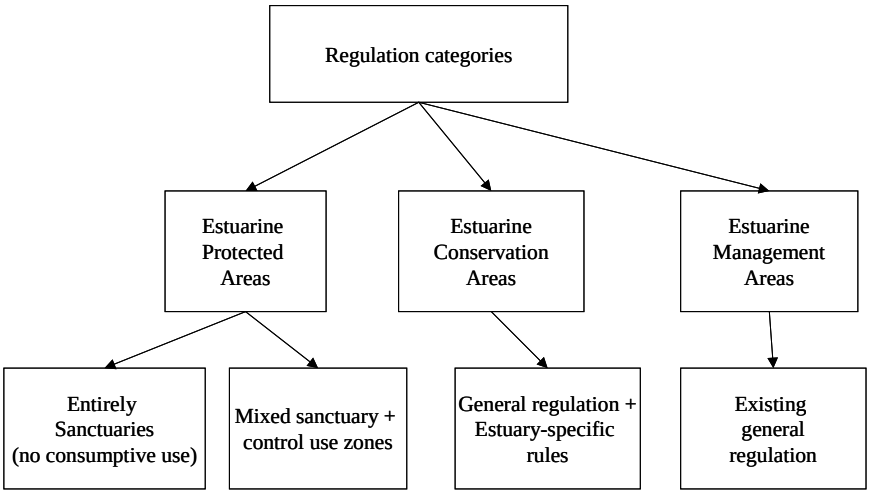

Figure 7: Categorisation of estuaries in terms of their systems of regulation.

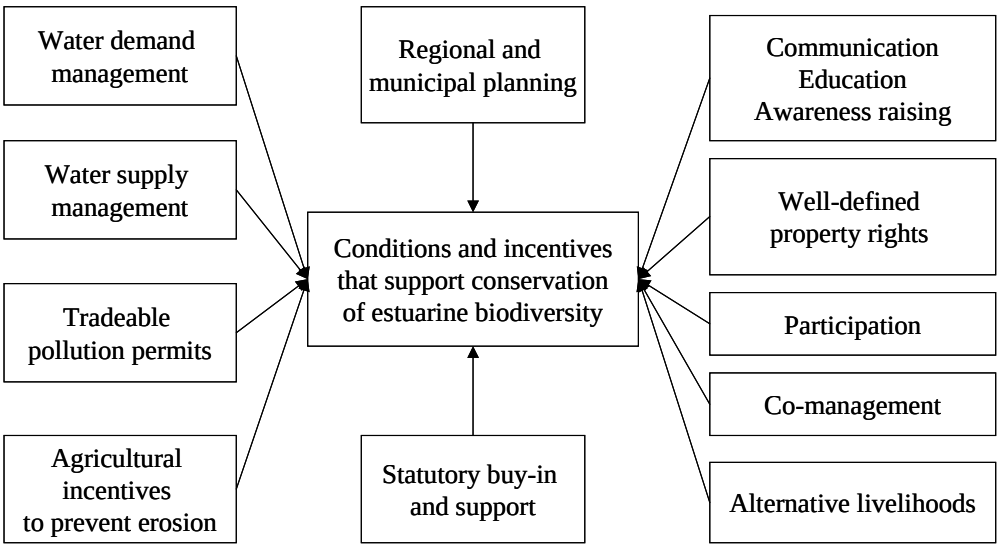

Figure 8: Strategies to improve conditions and incentives that support conservation of estuarine biodiversity, with catchment-level strategies on the left and local-level strategies on the right.

2.2.3 Monitoring

The goal of this project was to promote management oriented monitoring for estuaries, acknowledging that integrated development planning and co-management make provision for the participation of local stakeholders in monitoring. The approach was to develop, document and test a monitoring protocol using an interactive process that involved researchers and managers. Our knowledge of complex estuary systems will always be imperfect and since the future is unknowable, management decisions are based on informed hypotheses about the system and the future. Consequently, there can be no certainty that implementation of a particular management decision will direct condition towards the preferred state or vision stakeholders have for the estuary. To be effective, management requires a participatory process of experimentation, learning and adaptation. Adaptive management as this process is termed, has been incorporated into a management protocol for estuaries (Figure 9, page 24) in which the role of Estuary Management Forums (see also Figures 3 and 4, pages 14 and 16) is acknowledged. Each Forum should be set up by way of a formal Level 1 Agreement (see Figure 5, page 17) with the Authorities, particularly Local Government, in the context of the Integrated Development Planning process. Specific management responsibilities such as monitoring, rehabilitation and self-regulation of particular groups of people who use estuary goods and services or whose actions may determine the quantity and quality of these, are formalised by way of Level 2 Agreements.

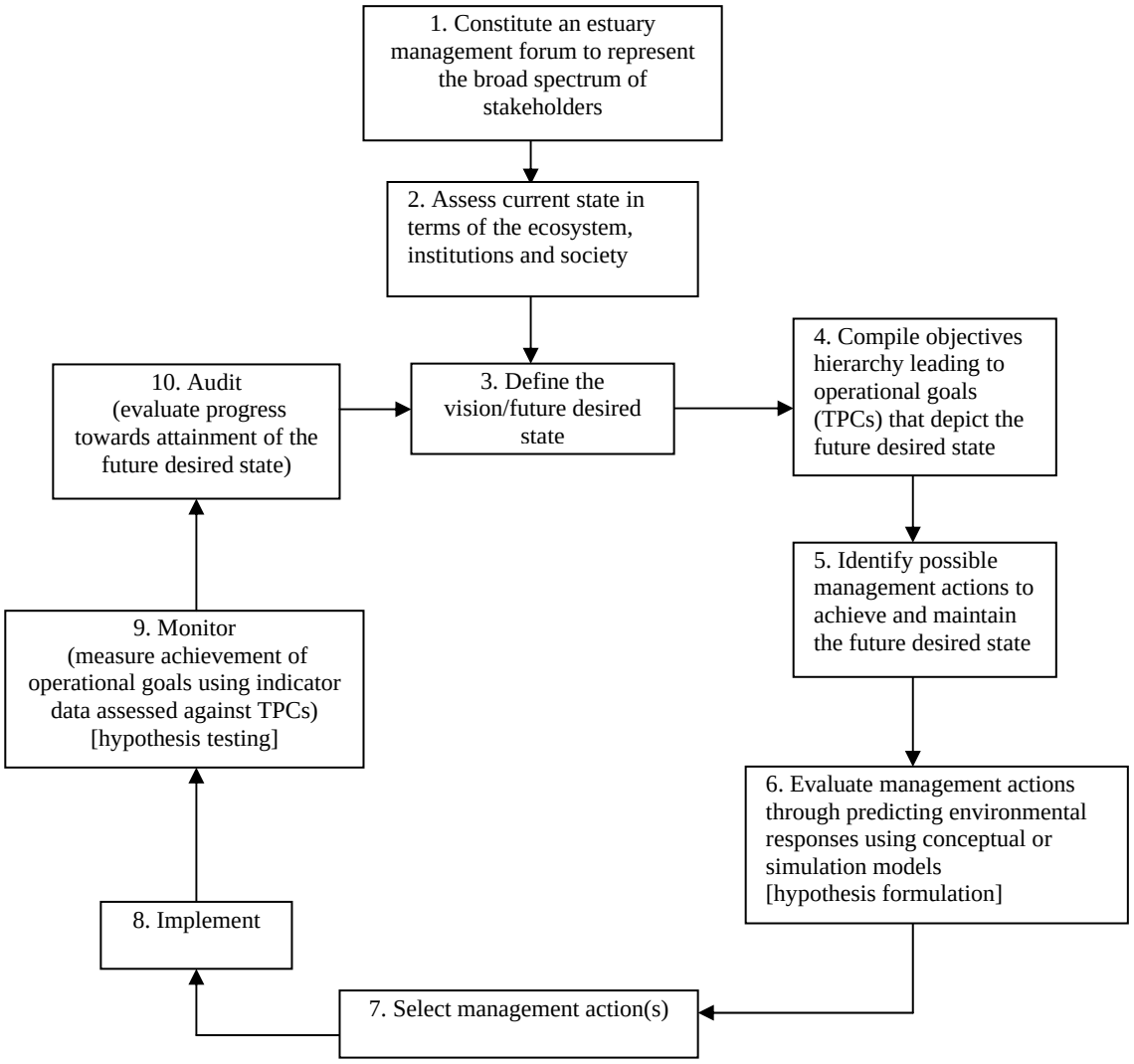

Figure 9: An estuary management protocol that incorporates the monitoring protocol proposed for South African estuaries (modified from Rogers and Biggs 1999).

The purpose of monitoring is to detect undesirable change in time to take corrective action efficiently. To do this we need to model change using indicators for each operational goal and determine a level (threshold) at which change should prompt management to evaluate the relevant hypothesis and determine whether or not to implement corrective actions. Thus, each indicator has to be embedded in a framework that facilitates interpretation and that includes Thresholds of Probable Concern (TPCs, Rogers and Biggs, 1999).

The process of structuring an Objectives Hierarchy drives effective and efficient monitoring by tracing a clear pathway of understanding between the desired state of a system and the operational goals that are used to measure progress towards achieving it. The Objectives Hierarchy for the monitoring protocol is founded on three elements of sustainability (ecosystem, institutions and society) and the dynamic processes that connect them. Ten key issues were identified and these provided the generic set of indicators:

- Ecosystem: Hydrodynamics and sedimentary processes; Water quality; and Biodiversity
- Institutions: Human activities; Planning and development; Law enforcement; Co-operative governance and co-management; and effective management
- Society: Human population growth; and Basic human needs.

The variability exhibited by South African estuaries is such that the objectives incorporated into the protocol are generic. They and the TPCs used to prompt management review, have to be refined to suit the context and particular properties for each estuary. A part of this context is the human and financial resources available for monitoring. To accommodate this, indicators in the protocol are structured in three levels of complexity and cost. Level I is suitable for use by Field Rangers with limited scientific expertise and requires basic and inexpensive equipment. Levels 2 and 3 require expertise in field measurement techniques, plant and animal identification and access to information for interpretative decision making. Each indicator is classified according to whether it measures a pressure, a state of the system or a response of the system to a pressure. Selected issues are used in Table 3 (page 19) to illustrate the Objectives Hierarchy. More details on the project are found in Volume II, Report E.

Table 4: Generic set of indicators for South African estuaries.

Vision: The health, diversity and productivity of estuaries is maintained or improved through co-ordinated and integrated management in a spirit of shared responsibility to optimise the opportunities and benefits estuaries provide		
NO.	PRESSURE / STATE/ RESPONSE	**ISSUE 1. HYDRODYNAMIC AND SEDIMENTARY PROCESSES (HS 1 - 5)**
		Objective: Hydrodynamic regimes are managed to support natural sedimentary processes
		Operational goals (TPCs): Specific for each estuary (See Volume II, Report E, Appendix C)
		Level 1 indicators
HS1	S	Record of freshwater inflow at gauges set up above the head of an estuary (if available, data can be obtained on request from Dept. Water Affairs and Forestry)
HS2	S	State of estuary mouth (open or closed) through visual observations (temporarily open estuaries)
HS3	S	Frequency and duration of episodic events (e.g. floods, drought)
		Level 2 indicator
HS4	S	Sedimentation in the mouth
		Level 3 indicator
HS5	S	Changes in bathymetry as a measure of long-term sedimentation processes
		ISSUE 2. PLANNING AND DEVELOPMENT (PD 1 - 4)
		Objective: Development is managed to meet social and economic needs without impacting on the health/integrity of the estuary
		Sub-objectives: (1) Land use alongside an estuary is guided by ecologically sound and socially equitable local and regional planning strategies (2) Land use planning for estuaries and catchments incorporates the principles of Integrated Environmental Management
		Operational goals (TPCs): Specific for each estuary (See Volume II, Report E, Appendix C)
		Level 1 indicator
PD1	S/P	Nature and extent of land use and infrastructure associated with the estuary and catchment
		Level 2 indicators
PD2	P	Number, type, extent and production of mariculture operations
PD3	P	Number of applications for new development or rezoning of land associated with the estuary
PD4	R	Use of tools such as Strategic Environmental Assessments (SEA) and Estuary Management Plans (EMPs) to guide planning and development (regional)

		ISSUE 3. CO-OPERATIVE GOVERNANCE AND CO-MANAGEMENT (CGC 1 - 5)
		Objective: Management by local, provincial and national government is integrated and co-ordinated, and co-responsibility partnerships are forged between government, parastatals, the private sector, special interest groups and the scientific research community
		Sub-objectives: (1) Communication and co-operation between management authorities is such that policies, strategies and projects are integrated and co-ordinated (2) Estuary forums are effective co-management structures (3) Co-operation between estuary management authorities and Catchment Management Agencies and/or Water User Associations aligns management objectives and improves efficiency and effectiveness
		Operational goals (TPCs): Specific for each estuary (See Volume II, Report E, Appendix C)
		All Level 2 indicators
CGC1	S	Record of management authorities (local and provincial), their areas of jurisdiction, frequency of interaction and degree of co-operation in terms of joint projects
CGC2	R	Number of estuaries where management forums are established to engage government on planning and management issues (regional)
CGC3	R	Number, type and cost (if applicable) of projects or initiatives that involve co-operation between local and/or provincial estuary management and the estuary forum
CGC4	R	Number of river catchments where Catchment Management Agencies, Water User Associations and Catchment Forums are established to manage freshwater resources and water related activities (regional)
CGC5	S	Degree of interaction and co-operation (in terms of joint projects) between the management of estuaries (local and provincial government and estuary forums) and the management of catchments (Catchment Management Agencies, Water User Associations, catchment forums local and regional)

2.2.4 Rehabilitation

Estuary structure and functioning is susceptible to degradation from influences arising over a wide range of scales and rehabilitation is required to mitigate undesired outcomes that arise both unintentionally and from intentional acts. Rehabilitation seeks to promote the recovery of ecosystem functions and values so that they accord with the vision stakeholders have of the preferred condition of the estuary. As such, it has strong social implications and is therefore regulated by policy and legislation. Rehabilitation actions should therefore occur in the contexts of co-operative governance and management as outlined above.

The goal of this project was to develop a protocol for rehabilitation in estuaries that reflects adaptive management and the process of Integrated Development Planning. Because estuaries are so strongly connected to processes occurring at scales much larger than those of the estuary, it is evident that scale (spatial, governance etc) should be reflected strongly in rehabilitation project planning. Also, because rehabilitation cannot always mitigate entirely the causes of degradation, it is commonly necessary to continually sustain the rehabilitated state. Rehabilitation should therefore involve both a project phase during which a plan is drawn up and implemented, and an ongoing stewardship that incorporates monitoring, which is structured and implemented according to the monitoring protocol outlined above.

Rehabilitation can be very costly, particularly where the ultimate threat arises at a catchment scale. Since resources are limited, it is necessary to decide which estuaries should be selected for rehabilitation and so criteria for guiding a prioritisation process have been developed:

- Preserve what is good before trying to fix what is bad

- Focus on rare types of estuaries before common ones; good condition estuaries before bad; deteriorating ones before those that are stable or improving; and those that are easy to fix before the difficult ones
- Prioritise on the basis of rarity of the ecosystem and /or importance in terms of biodiversity and estuary type (see protocol for biodiversity)
- Prioritise on the basis of goods and services provided by the estuary
- Incorporate broad level assessment when prioritising
- Prioritise on the level of confidence that rehabilitation is feasible
- Incorporate 'recovery potential' into prioritisation
- Assess willingness of and capacity for local structures to become involved and address the causes of degradation.

A framework to guide development of a rehabilitation plan is shown in Figure 10 (page 28). It comprises a number of steps and feedback loops reflecting its basis in adaptive management and should be conceptually connected with the structures and processes referred to earlier for co-operative governance and management and for particular issues such as sustainable use, biodiversity conservation and monitoring. It is important to appreciate that whilst technical aspects of rehabilitation may be achieved quite quickly, outcomes may take years to be realised because they commonly require changes in attitude, behaviour and ultimately culture. This is why it is so important to integrate rehabilitation into the overall adaptive management process for the estuary. The estuary monitoring system must be modified, if necessary, to incorporate objectives and TPCs that relate to rehabilitation not only of the biophysical aspects of the estuary, but also of the culture of users. The notion that rehabilitation is founded solely on technical intervention and regulatory instruments is incomplete. Procedures are required that have their foundations in the science of people (anthropology) and of development and the laws of human society (sociology).

The 'tools' that may be applied in estuary rehabilitation can be categorised using the framework, into:

- Planning tools
- Implementation tools
- Monitoring and evaluation tools
- Threat-based tools. These relate to the main asset classes, living resources, biophysical, industrial, institutions and infrastructure assets.

The relationships between Threats and Tools are illustrated in Table 5 (page 28) More details on the project can be found in Volume II, Report F.

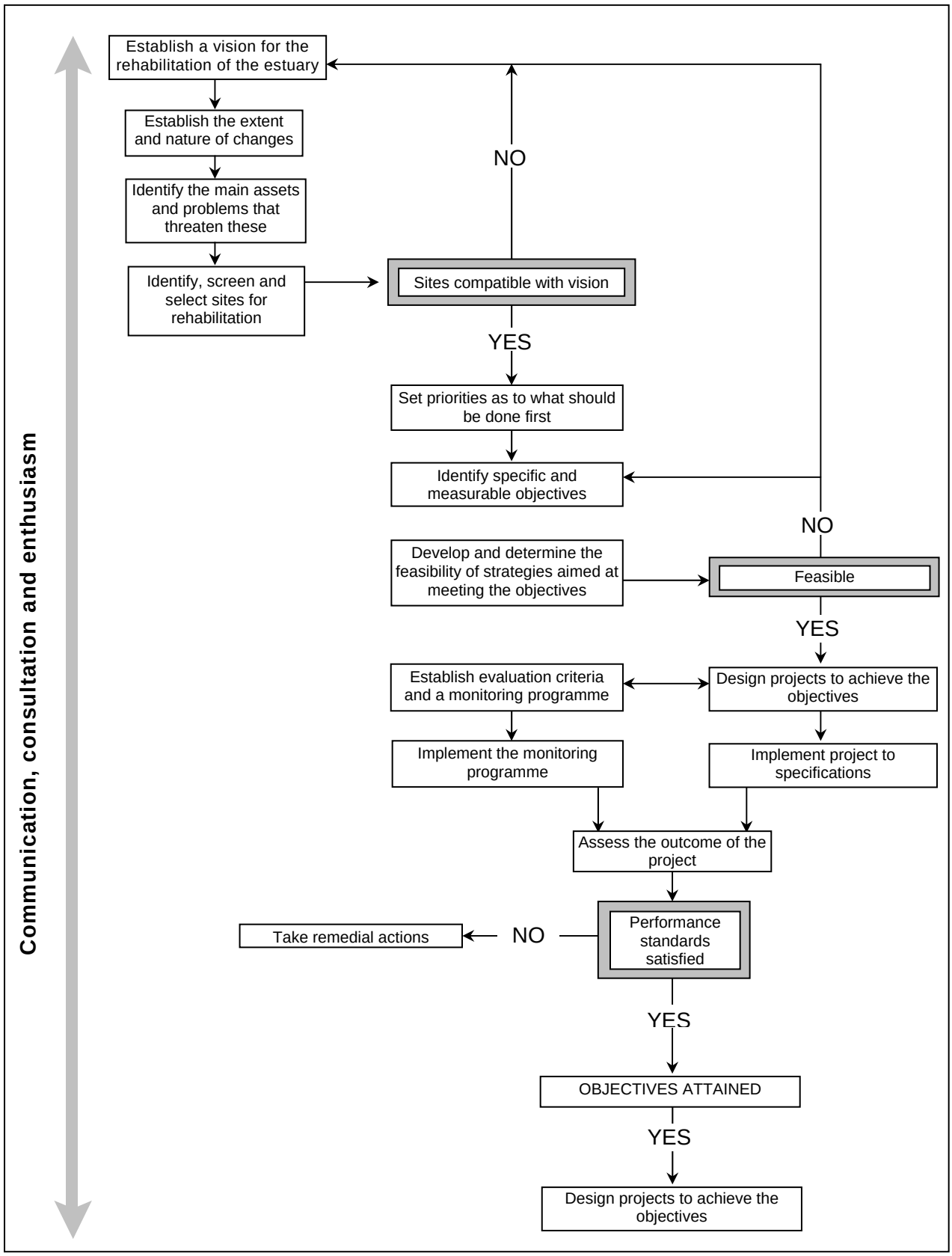

Figure 10: Conceptual framework for developing a rehabilitation plan at an individual estuary level.

Table 5: Examples of suitable tools for addressing some of the main threats to the asset classes identified for estuaries in the Eastern Cape.

THREATS	DRIVER	SCALE OF IMPACT	SCALE OF THREAT	TOOLS
Living Resource Assets				
Habitat alteration and loss	• Human interference	Local	National Regional Local	• Policy and planning • Project and strategic planning • Compliance and enforcement • Management and advise
Biophysical Assets				
Construction	• Conflict of needs	Local	Local	• Forward planning • Alternative design
Industrial assets				
Lack of co-ordinated pollution management	• Point source pollution	Catchment Local	Catchment Local	• Compliance • Incentives
Institutional Assets				
Lack of capacity and training	• Over-extended capacity • Skills migration	National Regional Local	National Regional Local	• Incentives
Infrastructural assets				
Poor planning and laws, Rezoning	• Accelerated urban expansion and lack of capacity to keep up	Local	Local or regional as relevant	• Creation and maintenance of buffer zones

2.2.5 Knowledge management

Co-operation, whether it be in governance or management, cannot occur if data, information and knowledge are not shared freely and openly. The basis of learning organisations is that there is continual transformation of data, which is tangible through information, and data that are understood, to knowledge or 'know how' which is personal and intangible. Knowledge management refers to the practices and approaches related to generating, capturing and disseminating know how. Since knowledge is personal, it is generated through social interaction: the wider the scope of interactions the more opportunity for learning and evolution of new knowledge. Whilst formal structures assist in knowledge sharing, these are more suited to exchange of data and information. Informal social processes (such as story telling and informal discussions) are more effective at facilitating the co-evolution of knowledge.

The goal of this project was to understand the dimensions of knowledge management as it relates to estuaries, particularly those in the Eastern Cape. The Tyolomnqa estuary was selected for a case study.

Decisions are most commonly made on the basis of knowledge rather than data or information, held by the decision makers. If there is to be consensus across constituencies there has to be a reasonable degree of knowledge equity. The study demonstrated that the processes used to interact and create opportunity for knowledge sharing and growth, differed markedly between constituencies. People from local villages did not have established formal structures to facilitate sharing of knowledge around issues of estuary management. Such formal structures as were used, were created for other purposes such as general community meetings. Whilst the Tyolomnqa Estuary Management Forum included participants from the villages and provided opportunities for learning, the mechanism for knowledge transfer both to and beyond these members was inefficient because of inadequacies in both the structures and processes for communication. The result was that the hopes of the Estuary Management Forum leading to a better informed and more widely based constituency among villagers was not being realised.

The research programme also sought to improve knowledge sharing among researchers. Researchers interacted largely through formal structures (meetings and workshops) and using information and communication technologies. Whilst these may be effective for generating awareness of ideas, they are not a substitute for personal exchanges that lead to shared understanding and knowledge co-evolution.

It also became clear that the village constituencies and the Estuary Management Forum were not only somewhat isolated from each other, but they were also isolated from the researchers. The research programme did not make provision for building a platform of knowledge equity among constituencies that would prepare them to use new knowledge being generated during the research. The outcome is that the knowledge gap between some constituencies has increased, complicating prospects for co-evolution of knowledge.

Another issue that surfaced during the study reflected reticence to share knowledge. Several factors may contribute to this, including a sense that one's knowledge is not valued and a desire to use knowledge advantage to compete more effectively.

Knowledge on management of the use of estuaries in the Eastern Cape is fragmented and the processes that are required to reverse this are not operating. It is difficult to envisage the intentions of government policy and legislation being effectively realised until there is improved access to knowledge and to the opportunity to learn from and with others. Co-evolution of knowledge occurs most spontaneously and efficiently when it is driven by a sense of purpose and need. The Integrated Development Planning process is required to reflect both the needs people have for the resources and the purposes for which they would choose to use them. It is the logical hub for knowledge management about the use of estuaries and could be the formative factor in the establishment of 'communities of practice'. These are characterised as groups of like-minded people brought together by common interests, in this case planning and managing the use of estuary resources. Estuary Management Forums are seen as logical structures to facilitate wider based 'communities of practice'.

There are also economies of scale that can be achieved through connecting with the IDP process. It would be inefficient to establish separate information centres for every aspect of integrated development planning, but a single centre could house the technology and support that would promote the better use and co-evolution of knowledge, particularly at the scale of an estuary. Such a Municipal Department or Centre (Figure 4, page16) would provide focus and motivation for the activities of the Estuary Management Forum.

3 PROGRESS TOWARDS MEETING AIMS

The overall aim of the research programme was that research should meet the needs of managers as expressed in a stakeholder workshop. At best research can hope to inform managers and provide new insights and approaches that managers may choose to adopt and apply.

The research findings indicate that whilst policies, legislation and the will may exist to promote co-operative governance and management, this is frustrated by confusion about the roles of local government and civil society. More particularly it is frustrated by the absence of formal delegation of responsibility. It is shown that coastal municipalities are likely to be pivotal in achieving the intentions of national and provincial policies. Their authority needs to be clearly defined and delegation must be formalised so that they are able to incorporate estuary issues into the integrated development planning process and be duly held accountable. The research has contributed to an improved understanding of the causes of and remedies for slow progress in achieving effective co-operative governance and management.

The research programme was also charged by the stakeholders to develop approaches for each of five issues. Protocols were developed for each of these and their linkage to the Integrated Development Planning process that is a legal requirement for municipalities, was shown. The Adaptive Management Process was used to create commonality of design so that the protocols can connect with one another.

The research aims were expressed as outcomes. As it turned out, however, the lack of clarity of which agency has *de jure* responsibility for planning and management at estuary level made this aim unattainable. A recommendation is made as to what this agency should be and a second phase for the research programme that would facilitate this is proposed.

4 CAPACITY BUILDING

The success of estuary management is dependent on the wide range of institutions and people who play a role in estuary management processes. The Research Sub-Programme aimed to make a contribution to estuary management by assisting in the process of building the capacity of estuary management institutions and estuary management stakeholders.

The Sub-Programme aimed to assist in building the capacity of estuary management institutions through:

- Involving a wide range of different research institutions in the implementation of the Sub-programme. Each individual project was led by a different research institution and many of

the projects involved more than one research institution. Despite this broad participation, institutional capacity building was sometimes limited as some institutions only chose to involve only members of their staff in the project and as a result those institutions probably did not benefit as much as the individuals themselves. Those Institutions linked to Universities benefited the most institutionally as they used the opportunity of the project to involve students.

- Involving estuary management institutions in the Steering Committee of the Sub-programme. A large number of estuary management institutions were invited to participate in the Steering Committee of the Research Sub-programme including National Government Departments, Provincial Government Departments, Local Government and Local Stakeholder Groups. While many institutions were invited, representation from a variety of different institutions was not always achieved, as a result only a few of the invited institutions benefited in a sustained way from participation.

The Sub-programme aimed to assist in building the capacity of individuals involved in estuary management through:

- Involving researchers in estuary management research. As discussed above a large number of research institutions were involved in the entire Sub-Programme, as a result a variety of individual researchers were involved in the Sub-Programme. The estuary management research capacity of these researchers was built through their opportunity to research their project area and also their exposure to the research of others.
- Involving students in estuary management research. A number of students were involved in each of the projects. The capacity of these students was built through the exposure to research opportunities. In many cases students successfully completed theses as part of their contribution to the Sub-programme.
- Involving estuary management stakeholders, researchers and students in a variety of Sub-programme events that aim to forward specific sub-programme aims and goals. Over the course of the Sub-Programme many different stakeholders participated in Steering Committee meetings of the Sub-Programme and workshops arranged for the individual projects. These individuals benefited through their exposure to research results and processes and through the opportunity to provide direct input into research.

5 CONCLUSIONS AND RECOMMENDATIONS

- The physical scale of estuaries and their siting within coastal municipalities, indicates a central role for municipalities at the interface between governance and on site management for estuaries. The authority for this role is established by the Municipal Systems Act that requires municipalities to prepare, maintain and implement integrated development planning. It is concluded that municipalities have, in general, experienced difficulties with preparation of Integrated Development Plans and that capacity will have to be improved to achieve their potential for contributing to managing the use of estuaries. By and large municipalities are the *de facto* managers for estuary development and use. They need also to be constituted as the *de jure* managers.
- It is **recommended** that the role of municipalities in promoting co-operative governance and management as it relates to estuaries that are not situated within formally protected areas, be

defined; that responsibilities for appropriate aspects of management be delegated; and that the arrangements be formalised by way of Agreements so that accountability is acknowledged.

- One of the purposes of co-operative governance is to deliver integrated development. As municipalities are required to establish structures and processes that promote integration on a local scale, these structures and processes can be used cost effectively and efficiently to promote the intentions of co-operative governance and management as they relate to estuaries. Municipalities are already linked upwards and outwards.
- It is **recommended** that the Integrated Development Planning Department within coastal municipalities acts as the Centre that is responsible for promoting co-operative governance and management for estuaries at municipal level.
- There is no national framework for estuary management or strategic guidance from national and provincial departments with regards to estuary management.
- It is **recommended** that municipalities be provided with strategic guidance from national/provincial departments with regard to local estuarine management. Strategic documentation should incorporate the co-operative vision and management objectives of leading national departments in order to prevent sectoral conflict at a local level.
- It is concluded that success in estuary management depends on progress across many fronts including national, provincial and local government, and within civil society. This research indicates that progress at local government level may be lagging behind that at national and provincial levels.
- It is **recommended** that more effort be focused at local level to stimulate participation in estuary management in support of national and provincial initiatives.
- Co-operation in governance and management can be effective only when civil society is organised to engage in these processes in a structured, informed and responsible manner.
- It is **recommended** that Estuary Management Forums be constituted and that their roles and responsibilities be formalised by way of Agreements between the Municipal Department/Centre (see above) and the Forum. The intentions of the Agreements are to mobilise civil society in support of shared goals and to promote accountability for self-regulation by constituencies represented on the Forum.
- Over-exploitation is shown to be one of the principal threats to sustaining the flow benefits to society from estuaries.
- It is **recommended** that the Rapid Assessment Matrix approach be adopted and applied as a co-operative approach between Municipalities and Estuary Management Forums to develop and implement strategies for managing the consumptive use of estuary resources.
- A national strategy for the conservation of estuarine biodiversity does not exist, despite this being a requirement for meeting national policies and the terms of international agreements. The very few estuaries that are contained within formally conserved areas are inadequate for conservation of estuarine biodiversity. Municipalities, through the requirement for integrated development planning, require guidance that would be afforded by such a national strategy.
- It is **recommended** that urgent attention be given to developing a national strategy for the conservation of estuarine biodiversity and that it be incorporated into the integrated development planning procedures at municipal level as soon as possible.

- The integrated development planning process is iterative, each cycle starting with analysis. At present estuary monitoring is not organised to deliver systematically into this adaptive learning process that promotes continual improvement. Consequently, the mechanism does not exist to efficiently and effectively mobilise resources in the public and private sectors in support of monitoring.
- It is **recommended** that the monitoring protocol developed in this programme be incorporated into the procedures used by municipalities to monitor progress with integrated development planning.
- The ability of estuaries to continuously deliver a diverse stream of benefits to society is threatened by actions that have a direct effect and by those that exert influences indirectly. The latter commonly arise distant from the estuary as in the case of upstream abstraction of water. Rehabilitation is commonly required to re-instate desired conditions. As these conditions have to reflect the shared vision of stakeholders, the rehabilitation process needs to be connected with the integrated development planning process and the monitoring process and should itself be an iterative, adaptive, learning process.
- It is **recommended** that the rehabilitation protocol developed in this programme be incorporated into the procedures used by municipalities when analysis in planning indicates the need for rehabilitation.
- Co-operation in governance and management cannot occur when there are wide disparities in understanding and knowledge. Existing structures and procedures are not effective in achieving a more equitable distribution of knowledge. Indeed the knowledge gap may be increasing.
- It is **recommended** that the municipal department charged with responsibility for integrated development planning, be established as a Centre that promotes the dissemination of data and information and acts with the relevant Estuary Management Forums to foster knowledge sharing, capacity building and empowering participation in governance and management.
- In light of the above conclusions and recommendations, it is further **recommended** that a second phase of this research programme be supported with the specific intention of incorporating estuary management into integrated development planning, and building the capacity for this in selected case studies.

6 REFERENCES

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