IMPACT STUDY OF THE ESTUARINE RESEARCH AND RELATED ACTIVITIES FUNDED BY THE WATER RESEARCH COMMISSION

Report to the

Water Research Commission

by

Charles Breen and Associates

Dr Charles Breen, Ms Linda Downsborough[1], Dr Dirk Roux[1], Mr Jackie Crafford[2]

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[1] Monash University

[2] Prime Africa Consultants

Obtainable from

orders@wrc.org.za

Water Research Commission
Private Bag X03
Gezina, Pretoria
0031 SOUTH AFRICA

orders@wrc.org.za

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"we can fortunately still rely on the WRC as the 'Anchor tenant of the Estuary Management Mall', to continue to provide research products which have given impetus to new directions as well as providing support for already identified management needs."

Dr Alan Boyd, Marine and Coastal Management

EXECUTIVE SUMMARY

The purpose of this investigation was to assess how Water Research Commission funding and involvement in estuarine knowledge generation impacted the social environment, the economic environment and the health and welfare of the people of South Africa. It is intended that the outcome of this study will assist the WRC in planning its future involvement and research agenda regarding estuaries.

Three aims were specified:

1. To assess the impact of the WRC estuarine research and related activities on the:
    a. Social environment: Relating to society or its organization, and specifically to the institutional and organizational strengthening in society of research providers, research users and research funders;
    b. Economic environment: Relating to the sustainable supply of provisioning estuarine ecosystem services;
    c. Health welfare of the people in South Africa: Relating to the sustainable supply of health services and cultural estuarine ecosystem services to society in general?
2. To develop an impact assessment report that fully addresses the objectives stated above.
3. To identify links between the WRC activities and those of other institutions, national and internationally.

The organisational aims of the WRC are relevant to four generic sets of actors in the field of estuarine science, which also represent the beneficiaries of WRC research outputs. These include research funders, research providers, direct research users and society in general (indirect research users). Success ultimately requires the needs and expectations of all groups of actors to be adequately addressed.

An analysis framework was developed which incorporates the perspectives of research funders, research producers and research users and included a set of indicators of research impact. Empirical data were gathered from experts using an internet-based questionnaire system. These data were supplemented with information from story-telling, selected personal interviews and a survey of the published literature. The survey instrument allowed the easy creation, dissemination, collection and analysis of survey results. The professional package also allows users to download survey results to a spreadsheet package, create reports and compare survey results and responses across the sample of respondents.

The study draws the following conclusions:

Overall conclusions

- The Water Research Commission has provided strategic direction and has been the principal funder for estuaries research for at least fifteen years. It must be largely credited with the credible scientific understanding and competence that has emerged in South Africa
- Estuaries research supported by funding from the WRC in particular, but also by DWAF and NRF, has had a significant and positive effect nationally and locally on the management of estuaries.

- The WRC approach to support for research is singular in that it has encouraged and provided opportunity for innovation whilst at the same time facilitating alignment with reality through feedback from managers.

Impact on social environment

- Water Research Commission funding for estuarine research has had a profound positive impact in the development and propagation of tacit knowledge about the structure, functioning and management of estuaries.
- The WRC through its reporting requirements and knowledge hub has been effective in making tacit knowledge explicit and accessible to a broad community.
- The WRC has been the principal funder for estuarine research in South Africa.
- Through its committed funding of estuaries research, the WRC is well positioned to leverage significant institutional support for research on estuaries in the future.
- The impact of WRC funded research is constrained by a weak 'chain of custody' for estuary management.
- The WRC funded estuaries research projects are considered to be aligned with national priorities.
- WRC funded research has not been synthesised within a unifying context.
- Research excellence and professionalism have been positively influenced.

Impact on economic environment

- The WRC support for estuaries research has positively and significantly raised appreciation for the value of benefits that are being or can be derived from estuaries.
- The economic impact of WRC funded research is constrained by the present narrowly conceptualised approach to socially oriented research on estuaries.

Impact on health and welfare

- The impact on health and welfare of WRC funded research on estuaries is indirect and considered to be significant and positive although there are no studies that quantify this impact.
- Estuaries have not been studied as complex social-ecological systems.

The links between the WRC activities and those of other institutions, national and internationally

- Funding from the WRC has had a positive and significant influence on collaboration among research providers based in academic institutions in South Africa.
- The strong focus on relevance, particularly for policy and management, has been a positive and significant motivating influence for research providers and research users to collaborate and engage stakeholders.
- There is considerable scope for the WRC to use the foundation it has established to engage with other institutions in ways that could lead to cost effective collaboration in a national estuaries research programme.
- Estuaries research funded by the WRC has a strong national orientation with minimal collaboration beyond national borders.

Recommendations

Recommendations made are specific to each term of the WRC mandate (www.wrc.org.za).

Promoting co-ordination, co-operation and communication in the area of water research and development

- It is recommended that the WRC adopt a social-ecological systems interpretation of its mandate. This will enable it to provide leadership (co-ordination, co-operation and communications) that accords with government understanding of water resources as embedded in complex social systems as set out in the National Water Act.

- It is recommended that the WRC support research into institutionalisation interventions aimed at strengthening the 'chain of custody' for estuaries in South Africa.

Establishing water research needs and priorities

- It is recommended that the WRC consider using a social-ecological systems framework to determine research needs and priorities and to develop an integrated national estuaries research programme that is also responsive to regional needs.

Stimulating and funding water research according to priority

- It is recommended that the WRC establish research partnerships and co-funding arrangements to refine the determination of priorities and to expand research on estuaries within the context of social-ecological systems.

Enhancing knowledge and capacity-building within the water sector

- It is recommended that the WRC raise its expectations of research producers, requiring publications that are subject to peer review.

- It is recommended that the WRC be more explicit in its requirements for the development of the necessary competencies across the 'chain of custody' for estuaries in South Africa.

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LIST OF ACRONYMS AND ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research
DEAT	Department of Environment Affairs and Tourism (now DEA)
DWAF	Department of Water Affairs and Forestry (Now DWA)
EKZNW	Ezemvelo KwaZulu-Natal Wildlife (formally Natal Parks Board)
EM	eThekwini Municipality
EWR	Environmental Water Requirement
IDP	Integrated Development Plan
IOE	Intermittently Open Estuary
JLBSI	JLB Smith Institute for Ichthyology (now SAIAB)
MCM	Marine and Coastal Management, Department of Environmental Affairs
NMMU	Nelson Mandela Metropolitan University (formally University of Port Elizabeth)
NPB	Natal Parks Board (now EKZN Wildlife)
NRF	National Research Foundation
REI	River Estuary Interface
RU	Rhodes University
SAEON	South African Environmental Observation Network
SAIAB	South African Institute for Aquatic Biodiversity (formally JLBSI)
SANParks	South African National Parks
SFTG	Subsistence Fisheries Task Group
UCT	University of Cape Town
UF	University of Fort Hare
UKZN	University of KwaZulu-Natal (formally University of Natal)
UN	University of Natal
UPE	University of Port Elizabeth (now NMMU)
UZ	University of Zululand
WRC	Water Research Commission

ACKNOWLEDGEMENTS

It is a particular pleasure to acknowledge those who made time to respond to the survey. It has been a wonderful experience for us to discover the enthusiasm, commitment and success that has been engendered through the support of the WRC. We hope that your insights will encourage the WRC to continue its support for research on estuaries.

We gratefully acknowledge Paulus Fouche and Southern African Association for Aquatic Scientists and Guy Bate and The Consortium for Estuarine Research and Management for assisting us by advising members of the survey.

In this report we include for personal stories reflecting on the impact of WRC funding for estuaries research. We thank Alan Boyd, Alan Whitfield, Duncan Hay, Guy Bate and Steve Mitchell for preparing these informative stories.

Desiree Lamoral assisted us with tracing references and citation indexes.

1. INTRODUCTION

1.1 Aim of the Study

The WRC, especially the Water-Linked Ecosystems Key Strategic Area, has been directly and indirectly involved in funding the research projects and other activities that generated knowledge about estuaries and their ecosystems. The WRC involvement enabled development of tools, methodologies, other innovations (including new ways of doing things) and human capacity that are used to manage estuaries in South Africa and beyond our borders. The WRC would like to assess how it's funding and involvement in estuarine knowledge generation impacted South Africa. The outcome of this study will assist the WRC in planning its future involvement and research agenda regarding estuaries.

1.2 Study Approach

The point of departure for this project is the set of Research Aims defined for all Water Research Commission (WRC) projects which relates to the impact of WRC funded research on the social environment, the economic environment and the health welfare of the people in South Africa.

Around these Research Aims, the project team have developed an analysis framework which includes a set of indicators of research impact. The historical impact of WRC research in estuaries science was thus measured using these indicators.

The indicators of research impact were measured using empirical data. The project team gathered empirical data from two sources: experts and literature. We gathered data from experts using an internet-based questionnaire system. However, indicators of research impact are limited in its application to some of the tacit and institutional benefits of research. In order to address these limitations, we include a story-telling section which demonstrates these less tangible benefits of estuaries research. A survey of literature published through the WRC, on estuarine research, complimented the study.

2. BACKGROUND AND REPORT STRUCTURE

Estuaries funded research by the Water Research Commission fall within Key Strategic Area (KSA) 2, Water-Linked Ecosystems. This KSA addresses the conservation of aquatic ecosystems, of which estuarine ecosystems are a component. The primary objective of this KSA is the provision of knowledge to enable good environmental governance so as to ensure the utilisation and sustainable management of water-linked ecosystems through study of the ecological processes underlying the delivery of ecosystem services. The objective of estuarine research is further to develop the knowledge to sustainably manage, protect, utilise and rehabilitate the estuarine ecosystem and to transfer the knowledge to appropriate end-users, and to build capacity in both research and management to sustainably manage aquatic ecosystems.

The WRC has thus identified technical, human capital and institutional objectives relevant to its research programmes. The technical objectives are embodied within the organisational aims of the WRC. These aims relate to the impact of the WRC estuarine research and related activities on the social environment, the economic environment and health welfare of the people in South Africa. The human capital objectives relate to direct capacity building through the research projects, as well as organisational and institutional strengthening achieved indirectly. The institutional objectives are embodied both in some of the social environment aims discussed above, but in addition, seeks to establish linkages with other institutions, both national and internationally.

This study analyses the extent to which the WRC investment in estuarine research has impacted upon the technical, human capital and institutional objectives of the organisation.

Section 3 sets out the research methodology followed. Section 4 analyses results and Section 5 concludes with recommendations.

3. RESEARCH METHODOLOGY

3.1 Project Aims

The overall purpose of this project is to determine the extent to which all relevant historical research in estuarine science, funded by the WRC, contributed to organisational mandate of the WRC as described in the strategy of the organisation (www.wrc.org.za).

The organisational aims of the WRC are relevant to four generic sets of actors in the field of estuarine science, which also represents the beneficiaries of WRC research outputs. These include research funders, research providers, direct research users and society in general (indirect research users). Thus, the three project-specific aims are:

1. To assess the impact of the WRC estuarine research and related activities on the:

    a. Social environment: Relating to society or its organization, and specifically to the institutional[3] and organisational[4] strengthening in society of research providers, research users and research funders;

    b. Economic environment: Relating to the sustainable supply of provisioning estuarine ecosystem services;

    c. Health welfare of the people in South Africa: Relating to the sustainable supply of health services and cultural estuarine ecosystem services to society in general?

2. To develop an impact assessment report that fully addresses the objectives stated above.

3 To identify links between the WRC activities and those of other institutions, national and internationally.

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[3] **Institutions** are structures and mechanisms of social order and cooperation governing the behavior of a set of individuals within a given human collective.

[4] O**rganisations** are social arrangements which pursue collective goals, control its own performance, and have a boundary separating it from its environment.

The project team gathered empirical data for measurement of the above research aims from three groups of interviewees: research funders, research providers, direct research users. The WRC research beneficiaries and impact categories, together form the analytical framework for this study, and are presented in matrix form in Table 1. Each relevant cell in the matrix is characterised by a set of indicators which was measured using empirical data, literature and story-telling techniques, as discussed below.

Table 1. This matrix summarises the analytical framework used for this study. The research aims are segmented across four categories of actors (research funders, research providers, research users and society in general; see list of respondent in section 7.4). Each relevant cell of the matrix is characterised by a set of indicators which would measure the institutional, organisational, economic and health effects of WRC research on these actors.

Research Aims	**Research funder**	**Research provider**	**Research user**	**Society in general (indirect beneficiaries/research users)**
Institutional impact	Has WRC research enabled funders to impact institutional issues?	Has WRC research enabled research providers to impact institutional issues?	Has WRC research enabled research users to impact institutional issues?	Not relevant
Organizational impact	Has WRC research enabled research funders to impact organizational issues?	Has WRC research enabled research providers to impact organizational issues?	Has WRC research enabled research users to impact organizational issues?	Not relevant
Economic impact	Not relevant	Not relevant	Not relevant	Has WRC research supported the sustainable supply of provisioning ecosystem services?
Health welfare	Not relevant	Not relevant	Not relevant	Has WRC research supported the sustainable supply of health benefits and cultural ecosystem services?

3.2 Indicators of Research Impact

The indicators of WRC research impact for every analytical sector of the study comprise a set of measurable research questions. Below follows a generic set of indicators or research questions, upon which the questionnaire was based. Quantifiable measures for each of these indicators/research questions were developed. These research questions and indicators formed the basis for a web-enabled questionnaire where we distinguished, for each indicator, between the impacts that WRC funded research has had on the responding individual as well as on a wider social scale.

1. **What has been the impact of WRC funded research on research providers?**
    - What has been the impact on attainment of research excellence?
    - What has been the impact on global recognition?
    - What has been the impact on researcher professionalism
    - What has been the impact on knowledge sharing?
    - What has been the impact on making research relevant to national issues?
    - What has been the impact on individual and institutional capacity building?
    - What has been the impact on communication of research findings?
    - What is unique in the WRC approach to funding research on estuaries?

2. **What has been the impact of WRC funded research on research users?**
    - What has been the impact on the strategic direction of research?
    - What has been the impact on capacity to adopt research findings
    - What has been the impact on policy and implementation?
    - What has been the impact on commitment to research?
    - What has been the impact on co-hosting researchers?
    - What has been the impact on institutional engagement?

3. **What has been the impact of WRC funded research on research funders?**
    - What has been the impact on strategic planning?
    - What has been the impact on leadership?
    - What has been the impact on scientific capacity?
    - What has been the impact on flexibility in the direction of research?
    - What has been the impact on knowledge sharing?
    - What has been the impact on continuity of research?
    - What has been the impact on adaptive learning?
    - What has been the impact on strengthening relationships?

4. **What has been the impact of WRC funded research on society in general?**
    - What has been the impact on subsistence livelihoods?
    - What has been the impact on commercial fisheries and related industries?
    - What has been the impact on tourism?
    - What has been the impact on biodiversity conservation?
    - What has been the impact on physical human health?
    - What has been the impact on spiritual human health?

3.3 Data Gathering

3.3.1 Internet questionnaire

Expert opinion was solicited from a population of research funders, research providers and direct and indirect research users ([please see Appendix 8 for a list of experts]) through completion of a detailed questionnaire (please see Appendix 8 for the questionnaire).

An online survey package called Survey Monkey was used to administer an electronic questionnaire. Survey Monkey allows the easy creation, dissemination, collection and analysis of survey results. The professional package allows users to download survey results to a spreadsheet package, create reports and compare survey results and responses across the sample of respondents. The team developed a professional survey template, displaying the WRC logo and linked to an e-mail system. The online questionnaire contained 4 sections including a general section that all respondents answered, and three separate sections with between 18 and 24 questions for research providers, research users and research funders. The questionnaire was first tested on 6 estuary experts. Their feedback and comments were incorporated into the final questionnaire which was activated online on the 25th March 2010. E-mails with a covering letter and the link to the online questionnaire were sent out to 150 potential estuary research funders, providers and users. The survey ran for a period of 4 weeks and closed on 22nd April. During this time, 2 general e-mail reminders were sent out on the 7th and 16th April. In addition, individual e-mails were sent out by the consulting team to key Estuary specialists to encourage reply. We received 35 completed questionnaires and 4 people completed more than one section of the questionnaire, for example, research provider and research user.

3.3.2 Literature

The literature data comprise the body of publications emanating from the research funded by the WRC and associated research funders. Once the indicators and measures for this study were finalized a thorough analysis of this data source was conducted. This included sourcing of all WRC estuary studies, followed by analysis and measurement of the relevant indicators (e.g. number of publications, profile of researchers, models developed, degrees obtained, collaboration achieved, number of citations, and others). We also investigated the research funding invested in all these efforts.

3.3.3 Storytelling

Two modes of cognitive thought exist through which people order and analyse their experience. One mode is logico-scientific, and attempts to fulfill the ideal of a formal, mathematical system of description and explanation. It employs categorization or conceptualization and the operations by which categories are established, instantiated, and idealized. Data-gathering through indicator-based questionnaires and literature surveys as set out above, fall in this category. The other mode is the imaginative application of the narrative which leads to good stories, and historical accounts. It deals in human or human-like intention and action and the consequences that mark their course[5].

[5] From Jerome Bruner, Actual Minds, Possible Worlds, Harvard University Press, Boston, 1986, page 11-13

A good story communicates quickly, naturally and clearly. By drawing on this "natural" method of communication, storytelling helps us make sense of a chaotic world by connecting us with time and space and human purpose of a sequence of events so as to make sense. It also communicates truthfully, accurately and intuitively. Storytelling provides the context in which knowledge arises, and hence becomes the normal vehicle for accurate knowledge transfer. In addition, the role of tacit knowledge has become a major preoccupation because it is often the tacit knowledge that is most valuable. Through storytelling we are able to communicate more than we explicitly know[6].

The storytelling technique was used to investigate specifically some of the institutional benefits and tacit knowledge benefits yielded by WRC research programmes.

Stories are analysed by identifying "claims" made by the storytellers and relating those claims to the analysis at hand.

3.4 Analysis

On completion of the data gathering phase, all data was captured in a database and analysed for report writing purposes.

3.5 Summary of Methodological Steps

1. Review and complete analytical framework
2. Draft preliminary questionnaire (version 1)
3. Conduct limited expert interviews (optional)
4. Update questionnaire (version 2)
5. Develop questionnaire tool
6. Test questionnaire (compare outputs against analytical outputs for achievement of research aims)
7. Complete questionnaire (version 3)
8. Conduct data gathering and capturing
9. Analysis
    a. Questionnaire data
    b. Literature
    c. Stories
10. Report writing
11. Comment and feedback from limited experts
12. Final report
13. Final report back session and recommendations to WRC

[6] Transcripts of the Smithsonian Associates events on organizational storytelling in 2001.

4. ASSESSMENT OF IMPACT

4.1 Discussion of Questionnaire Responses and Stories Told

4.1.1 Research excellence

Research excellence is determined through peer review and impact on knowledge and practice. The methodology for assessing excellence is well developed in the academic context because of the importance attached to original knowledge published in professional journals. It is difficult to assess research excellence among consultants because there is not a requirement for peer review. Thus whilst we acknowledge that consultants may achieve research excellence, it is presently not possible to assess this in the context of WRC support for research on estuaries. It is important to acknowledge the contribution consultants have made particularly in the context of establishing procedures for determining the environmental Reserve and in formulation of management plans for estuaries.

For the purposes of the survey, research excellence was defined as research for which (a) "findings are published in high impact, international, peer reviewed journals" and (b) where "researchers are actively contributing to the development of the global body of scientific knowledge as measured by citation indices."

It is interesting to note that, on average, users, providers and funders of research believe research excellence to be an important indicator of research impact. It is equally interesting to note that among research providers there seems to be a love-hate relationship with this indicator. Although the majority of respondents (14) in this category felt that research excellence is important, two rated it as the least important and a further two as the second least important indicator out of ten. No research provider gave a neutral rating to research excellence. This could possibly reflect a difference in the nature of the "research" provided by the respondents, where respondents who work in an academic environment would likely agree that research excellence as defined in the survey is important. On the other hand, researchers who are mostly engaged with consulting services may feel that research excellence is not an important indicator for assessing the impact of their work. However, this possible explanation remains speculative.

To the question of whether WRC funding for estuaries research had a significant, positive impact on their personal attainment of research excellence, research providers responded as follows: Definitely true (5); largely true (4); and partially true (8). This is a generally positive response but not overwhelmingly so. Similarly, to the question of whether WRC funding for estuaries research had a significant, positive impact on acknowledgement of research excellence in South Africa, responses were definitely true (5), largely true (2) and partially true (9).

The survey question related to discourse (whether researchers are actively contributing to the development of the global body of scientific knowledge as measured by citation indices), received a similarly neutral response. Research providers feel that it is definitely true (2), largely true (4), partially true (4) and definitely not true (2) that WRC funding for estuaries research had a significant, positive impact on the citation indexes of their personal publications. They feel that it is definitely true (2), largely true (4), partially true (8) and definitely not true (1) that WRC funding for estuaries research had a significant, positive impact on the global body of scientific knowledge.

Yet, respondents listed examples of their most cited papers that demonstrate that their research has yielded some well cited papers in high-impact journals (Table 1).

Table 2: Nine respondents listed examples of their most cited papers. This table indicates the journals in which those papers were published, the number of citations per paper and the 2009 Impact Factor for each journal. Researchers report that they draw support from different funders and it has not been possible to determine the relative contribution to these publications from the WRC.

Journal	**Number of papers and (number of citations[&] for each)**	**2009 Impact Factor[$]**
African Journal of Aquatic Science (NISC)	2 (0, 0)	#
(South) African Journal of Marine Science* (NISC)	4 (2, 33, 38, 3)	1.520
African Zoology (Sabinet)	1 (15)	0.746
Aquatic Botany (Elsevier)	1 (0)	1.697
Biological Control (Elsevier)	1 (17)	1.612
Biological Invasions (Springer)	1 (0)	3.074
Botanica Marina (Walter de Gruyter)	1 (1)	1.090
Environmental Biology of Fishes (Springer)	1 (17)	1.155
Estuaries and Coasts (Springer)	1 (12)	1.554
Estuarine, Coastal and Shelf Science (Elsevier)	3 (17, 3, 56)	2.072
ICES Journal of Marine Science (Oxford University Press)	1 (45)	1.920
Journal of Experimental Marine Biology and Ecology (Elsevier)	1 (90)	2.116
Marine and Freshwater Research (CSIRO Publishing)	2 (17, 0)	1.561
Marine Biology (Springer)	1 (8)	1.999
South African Journal of Science (Open Journals Publishing)	1 (24)	0.506
Water SA (Water Research Commission)	2 (24, 14)	0.911
Book Chapter	1 (16)	-

[&] Number of citations obtained from Science Citation Index Expanded (SCIE), except for the book chapter where Google Scholar was used.

[$] The Impact Factor of a journal is the ratio between the number of peer-reviewed papers published in the journal in the two years preceding the assessment and the number of citations to these papers in the broad scholarly, indexed literature during the year of assessment (2009 in our case).

This journal was recently (2007) accepted into Thomson Reuters Science Citation Index and an Impact Factor for it is pending.

* The African Journal of Marine Science was formerly known as the South African Journal of Marine Science.

Citations to papers tend to accumulate over time. Of the 25 papers listed by respondents and summarised in Table 1, only five were published prior to 2000. These five papers have accumulated 90 (1987), 56 (1992), 33 (1997), 38 (1997) and 16 (1999) citations respectively. Two of the listed papers were only published in 2009 and have not been cited to date, which is understandable.

From Table 2 it is clear that some research providers have successfully published in high impact journals and their papers have attracted significant attention. Why is there an apparent disconnect, at least for some researchers, between this success and WRC funded research? We would suggest that important enablers of research excellence are continuity of funding and associated leadership, and a relative degree of flexibility in how research projects are managed. As such these two factors were included as impact indicators in the survey. Although both were rated as less important indicators, respondents were generally positive about the flexibility of WRC funded estuary research. Respondents were less convinced that continuity of funding and consistent leadership, which is conducive to long-term research, has been established. Some respondents acknowledged the role that the Consortium for Estuarine Research and Management has played in this regard; others mention programmes such as the Eastern Cape Estuaries Management Programme and C.A.P.E. Estuaries Programme that have also received support from various sources including government and the private sector.

Given the high importance with which respondents view research excellence, how can WRC foster research excellence more intentionally? Following are a number of suggestions:

- *Feature research papers more prominently*: While most research reports resulting from WRC-funded research are available for download from the WRC Knowledge Hub, very few associated research papers make it onto this Hub. Copyright is an issue and it may not necessarily be possible to make full-text versions of all research papers available. However, even making references and abstract available, with web links to the source journals, would make WRC's acknowledgement of research excellence more visible and pronounced. A complicating fact is that there are often long lags between the completion of specific research contract and the publication of resulting papers. While WRC has a direct interest in publishing the research report(s), publication of journal papers is outside of their control and appears to be of indirect interest only. However, papers contribute to scientific learning in a complementary but also very different way than research reports. As such it may be necessary for WRC to look into mechanisms and rewards that would allow more active and accurate tracking of papers that result from their funding.

- *Encourage and make budgets available for selected journal publications*: Project teams commonly see the submission of the research report as the completion of a project. Where innovative research has been done, individuals, their organizations, the WRC, South Africa and the scientific community would enjoy additional benefit if the team takes the extra step of preparing and publishing a paper in a journal of high standing. WRC could actively encourage teams to publish their work where high potential exists at the end of a project, and make a budget available to facilitate production of such publications.

- *Best paper award*: An annual best paper award, specifically for papers that originated from WRC-funded research, would demonstrate WRC's commitment to research excellence. Such an award may also encourage research providers to acknowledge the WRC in their papers and to submit their published papers to the WRC, even when publication takes place long after completion of the project.

- *Develop indicators and benchmarks for assessing research excellence*: It may be a useful exercise for the WRC and research providers to deliberate and jointly decide on indicators and benchmarks for assessing research excellence.

- *Distinguish between research, implementation and consulting*: Research excellence could only realistically be expected from research projects – i.e. projects in which a research question is being addressed. The WRC funds various types of projects and it may be useful to distinguish between, for example, research projects, implementation projects and consultancies. Such a distinction would influence how projects are assessed.

4.1.2 Knowledge Sharing

Knowledge sharing has been defined in this research as two activities: researchers sharing their findings and insights with leading international peers, researchers from other disciplines and parties that represent other knowledge forms as measured by co-authorship in peer reviewed journals; and when knowledge sharing has been explicitly supported through the facilitation of opportunities for social sharing, discussion and a commitment to the publication of reports, fact sheets and other publications in easily accessible language. Knowledge sharing also has relevance with communication, discourse and the knowledge base of estuaries research.

All three groups in this research concluded that knowledge sharing was an important indicator in estuaries research and overall the second most important one after research excellence which has been discussed above. Twelve out of eighteen research providers and thirteen out of fifteen research users ranked Knowledge Sharing as one of the four most important indicators out of ten (refer to questions RU 19 and RP 25). Research funders seemed split on their conclusion of knowledge sharing as an important indicator with one ranking it as the third most important indicator and the other as the eighth.

With reference to specific questions of knowledge sharing
Seventy percent of all research providers (14 out of 20) and sixty six percent of all research users (10 out of 15) suggested that funding provided by the WRC for estuaries research had enabled

a) Them personally as research providers/users to share knowledge and
b) Researchers (related to estuaries) to share knowledge with other research providers, users and funders.

A report and subsequent academic paper with twenty authors, from various disciplines and organisations was highlighted by three respondents as evidence of knowledge sharing. The paper, entitled “A multi disciplinary study of a small, temporarily open/closed South African estuary, with particular emphasis on the influence of mouth state on the ecology of the system” was published in 2008 in the African Journal of Marine Science, which has in impact factor rating of 1.52.

To the question of whether WRC funding for estuaries had a significant positive impact on the commitment to knowledge sharing among research providers, research users, research funders and the wider community in South Africa the following responses were provided.

Research providers: Definitely true (4), largely true (6), partially true (7), definitely not true (1) and not applicable/don’t know (2).

Research users: Definitely true (5), largely true (5), partially true (3), definitely not true (0) and not applicable/don’t know (2).

There is a generally positive response overall from both groups with research providers being slightly more unsure than research users with seven respondents partially true. This uncertainty from the research users may be highlighted in some of their comments. “*Knowledge sharing is limited to the wider community of South Africa” “WRC estuaries research has made a contribution to this research field but I don’t see how it has increased commitment”.*

The production and distribution of publications, reports and fact sheets in easily accessible language is another key component of knowledge sharing. In terms of the question as to whether WRC funding for estuaries has had a significant positive impact on making their own research findings accessible to society, less than half the respondents thought this to be true. *"I believe we are still not getting the research package right" "there is a huge gap between researchers and managers, where data is often lost and an even bigger gap between researchers and layman regarding what research is being done… Not enough glossies reach the general public"*. Respondents were however optimistic about the opportunities that were available for research findings to be communicated with society, for example through Water Wheel, Estuaries management handbook, WRC glossy and technology transfer (TT) reports.

Knowledge is more effectively shared when it is considered relevant. The perceived "gap between researchers and managers" may reflect that knowledge generated by research producers is not well contextualised for research users and more particularly managers. Contextualising is not simply a matter of packaging research findings, it has much to do with how relevance is taken into account when research is conceptualised and conducted. This is considered further in 4.1.4 below.

A final question relating to knowledge sharing was that of whether WRC funded research has had a significant positive influence on the knowledge base of estuaries. Seventy five percent of both research providers and research users agreed that this was true with the remaining few partially agreeing or not feeling they could respond. *"A large section of estuary research in the country [South Africa] has taken place through WRC funding". "We have a more in depth understanding of how estuaries work, which is made obvious by the vast number of WRC reports on all aspects of estuarine structure, function…" "Knowledge on temporary open/closed estuaries was virtually nonexistent in many areas prior to the inception of the WRC funding programme".*

Given the high importance with which respondents view knowledge sharing, how can WRC foster knowledge sharing more intentionally? A few suggestions follow:

- Greater multi-disciplinary teams would facilitate active knowledge sharing amongst the researchers in the team. Reports written from and offering different disciplinary perspectives on issues/concepts would also foster a greater depth of knowledge.
- Knowledge sharing (in various forms) should be made more explicit in the proposal and then explicitly stated in the terms of reference. For example, this research should yield a) one journal paper, b) one international conference proceeding, c) one glossy article etc.

4.1.3 Relevance

> *"The essence of the (WRC) strategy is, therefore, to be continuously relevant and effective in supporting both the creation of knowledge through R&D funding and the transfer and dissemination of created knowledge"*

The WRC mandate is strongly oriented toward the identification and solving of the water-related problems that challenge the country now and that will do so in the future. To this end the WRC's strategy is directed toward being continuously relevant. In this assessment we argued that the WRC would achieve this intent through its support for research if it: creates opportunities for research providers to engage relevant research; encourages development of knowledge with explicit recognition of its intended application; delivers research outputs that are considered relevant to national issues; and if it articulates a clear case for research that aligns with national priorities.

Our assessment shows that there is a widely held perception among research providers that WRC funding has created opportunities for them to engage research which explicitly recognizes its intended application. Because of this, research providers consider that they have had a significant positive impact through influences on estuary management and policy development in South Africa in particular, and to a lesser extent outside of the country. The validity of these perceptions was tested by investigating the perceptions of those who use the research on estuaries. Notably this group of interviewees rated Relevance (together with Research excellence and Knowledge sharing) as an important indicator for assessing the impact or research. Within the sample there was a widely expressed opinion that estuary research had enabled them individually to positively influence the well being of resource users. The validity of this determination is supported by the generally expressed belief among research users that research has had a significant positive influence on the knowledge base of estuaries and also on policy and practice in the management of estuaries.

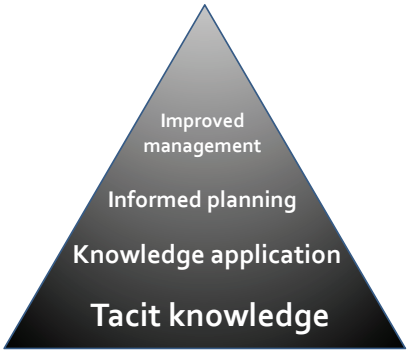
When research influences estuary policy and practice in the management of estuaries it is assumed that this will result in improved societal well-being (see 4.4 below). Whilst this is likely to be valid at the scale of society, the influences at smaller scales and in different locations can vary between positive and negative. Thus while it is reasonable for research producers and research users to claim to have positively influenced the well-being of resource users in general, a much more refined analysis would be desirable. This understanding suggests that it would be constructive to consider the issue of relevance within the context of social-ecological systems as this would help us better understand the implications of 'relevance' in societal well-being. A critical review of estuary research in the context of social-ecological systems would provide a foundation for a national estuaries research programme that would contribute to the WRC remaining 'continuously relevant' within society

To remain continuously relevant requires leadership and strategic direction. We tested this by asking whether WRC funded research has provided and fostered leadership at the national scale. Research providers and users believed this to be largely true. This is founded on the perception that strategic planning articulates a clear case for WRC funded research to align with national priorities. Examples used to illustrate this include RDM studies, fresh water requirements, policy and management of estuaries. We also tested this by enquiring of research providers whether funding and consistent leadership has been established that is conducive to long-term research. Respondents believed this to be generally true and illustrated this by listing examples including the Eastern Cape and C.A.P.E. Estuaries Programmes and support for the Consortium for Estuarine Research and Management. However some interviewees observed that there is no **national** estuaries research programme that provides effectively for integrated research and monitoring, particularly for enabling better response to long-term changes including those consequent upon climate change.

A national estuaries research programme would require institutional collaboration in the formulation of both a research strategy and a funding strategy. Whilst research providers suggest that WRC funding has had a significant positive impact on institutional commitment and that project steering committees contribute to this, it is evident that there is insufficient institutional collaboration to support the development and operation of a national estuaries programme. This suggests that notwithstanding strongly positive perceptions of relevance described above and institutional collaboration particularly in the C.A.P.E. programme, WRC support for estuaries research has yet to leverage institutional collaboration at the national and international scale. This would be a prerequisite for establishing a budget capable of meeting the needs of the envisaged national estuaries research programme.

4.2 Institutional Impact

The WRC achieves institutional impact when it positively and significantly changes aspects of the structure and mechanisms (e.g. policies) of social order and cooperation governing the behavior of a set of actors within a given human and organizational collective. In refining this definition, we propose that four levels of knowledge institutionalisation exist, as presented in the "WRC knowledge hierarchy". Tacit knowledge forms the foundation of the hierarchy as every individual within the WRC community of practice becomes more knowledgeable and experienced. The tacit knowledge effect of the WRC is expected to be most profound on the research provider community, with spill-over effects to other members of the community of practice. Thus, at a higher order level, application of estuarine knowledge to a large variety of situations by a variety of research users (such as government officials, harbour engineers, conservation agencies and the like) would be expected to improve. We would further expect that various estuary planning processes would be significantly improved and to some extent, standardised, as the systemic understanding of estuarine functioning improves. The final test of WRC knowledge institutionalisation would be to assess whether the management of estuaries is positively influenced.



Our investigation collected several sets of data relating to the institutional impact of the WRC on the community of practice that funds, conducts and benefits from estuaries research. Firstly, our questionnaire survey posed a number of questions which explicitly enquired about the institutionalisation within and between organisations and implicitly enquired about institutionalisation mechanisms. Secondly, the expert interviews and stories told provided information about specific institutionalisation events initiated by WRC funding.

There is no doubt that WRC funding has had a very significant, positive impact on developing and continuously strengthening the tacit knowledge base of estuarine science in South Africa. This is evidenced through the large number researchers, spread across the full spectrum of participating organisations, and who constitute the estuarine research community of practice, who actively participate in research programmes and publish research results. Questionnaire respondents reported positively on the increased competency of individuals within this community, as a result of WRC funding.

Most notably, WRC estuarine funding has played a significant role in the establishment and growth of coordinated function of CERM and CAPE estuaries programme. Through these initiatives it has not only facilitated tacit knowledge creation and networking amongst practitioners, but it has succeeded remarkably in institutionalising the application, planning and management aspects discussed above. This is evidenced by interviewee opinion on their own competency creation, impetus provided to the development of the eco-classification system for estuaries and various practical applications of the CAPE estuaries programme and estuary management initiatives.

A number of interviewees expressed concern with a perceived institutionalisation weakness with respect to government personnel. This weakness probably results from a higher turnover of government staff, and is an external factor, beyond the control of the WRC, and best described as a capacity weakness within government. Related to this is a weak chain of custody in estuarine

management in South Africa. The Department of Water Affairs, Catchment management Agencies, Marine and Coastal Management (MCM), Transnet, SANParks, provincial conservation authorities and municipalities all are variously responsible for estuarine management. There is however poor evidence that all these bodies of state interact constructively to govern estuaries. As a result, the onus falls on society to play a far larger role in institutionalising sustainable estuarine management.

Thus, in addition to continuing with current research support to estuarine science, we propose additional and targeted institutionalisation interventions directed at the identified bodies of state as well as society in general. These actors are agents of change who can play various decisive roles in improved estuarine planning and management. Such interventions can include targeted research programmes, training workshops, guidelines and policy briefs. The CAPE estuaries programme has made significant progress in this direction and we propose that these initiatives be further strengthened and developed.

A weakness worth mentioning is the lack of international institutionalisation achieved. We propose that international linkages, both to communities of practice within the Southern African metasystem of estuaries (i.e. into Mozambique and Namibia); and international research communities in similar ecosystems, be actively pursued in future work.

4.3 Organisational Impact

The WRC is a facilitator or 'catalyst' in the search for solutions to the water resource challenges we face nationally and regionally. Because these challenges are embedded in complex social-ecological systems, for the WRC to succeed in this function it must enable collaborative social arrangements across a range of scales. These vary from the scale of research programmes to national and even international arrangements that allow stakeholders to pursue collective goals and control their own performance. We used two indicators to measure organizational impact: whether the WRC funding promoted social arrangements that enabled organizations to pursue collective goals and secondly, whether they were given the freedom to control their own performance. In this latter indicator it was also important that performance meets appropriate standards (Section 4.1.2 above).

At the scale of research programmes the evidence indicates that WRC funding had a very positive and significant impact bringing about collaboration among researchers drawn from different universities and other research organizations. Four cited examples that illustrate this are the collaboration between SAIAB, NMMU, UKZN and UZ that developed an integrated research programme on temporarily open/closed estuaries; the Consortium for Estuarine Research and Management that serves as a crucible for establishing goals and enabling stakeholders to pursue these collectively; the third and fourth examples, National Estuary Health Assessment and estuary management (Eastern Cape Estuaries Research Programme and C.A.P.E.), illustrate both 'horizontal' collaboration (between research organizations) and 'vertical' collaboration through which national departments have been drawn in to pursue collective goals. The evidence is strongly supportive of individual projects having significant positive impact on participating organizations.

"Researchers and government in the Western Cape took the same work and used it as the foundation for the C.A.P.E. Estuaries Programme" Duncan Hay

A feature of the survey was the number of respondents who contribute both as research providers and research users (mostly consultants). Those who 'straddle' these two domains are critically important determinants of the rate of uptake of new findings, while at the same time they encourage more pragmatic definition of research objectives. They also sustain the discourse across the potential divide and in so doing increase the horizontal and vertical organizational impact of WRC funded research. This has contributed in a very significant positive way to building relationships, establishing collective goals and controlling performance in pursuit of those goals. Knowledge generated has been very influential in understanding the ecological and social (including economic) impacts of proposed expansions for the harbours of Durban, Richards Bay and Saldanha Bay.

"…..has resulted in many ideas for research that are unlikely to have emerged had there not been such co-operation" Guy Bate

"This "co-ordination" was a key focus of the National Estuary Workshop in 2000 (supported by WRC staff), but also the EC Estuaries Management programme of the WRC, which began by addressing matters the other way around, from the bottom up. Fortunately the two approaches have fairly regularly met in the middle" Alan Boyd

Effective collaboration for setting and pursuing collective goals requires sustained discourse. Research users generally agreed that the WRC has a programme of events (mostly project steering committee meetings) that sustain discourse and that this has had a significant positive impact on the strategic direction of research in South Africa. Research providers attribute this in part to the willingness of end user organizations and community members to dedicate time to make meaningful contributions to the strategic direction of WRC funded estuaries research. However, whilst research users indicated that WRC funding for estuaries research had a significant positive impact on their willingness to dedicate their time for meaningful contributions and that knowledge sharing has made them more committed, there was less agreement on the influence this has had on the strategic direction of research in South Africa. This may explain why some research users felt that the research had clear strategic direction whilst others were less convinced. Perhaps their national priorities were not addressed and thus they felt their influence on strategic direction was less than desired. This suggests that collective goals at national scale are either not fully appreciated by stakeholders or they have yet to be achieved. Sustained purposeful discourse at national scale will be required to establish collective goals that are perceived as being continuously relevant to affected organizations at provincial and national scale (see 4.1.3). Clearly organizational impact is mitigated by perceptions around the national strategy.

A tension can arise between defining collective goals that direct research and giving research providers the freedom to explore modes and structures of practice that lead to innovation. Research providers and users held a view that WRC research projects gave researchers the required flexibility within the limits of scientific and financial accountability, to control their own performance. That this self control among research providers was effective is evidenced in both the quality and relevance of the research (see 4.1.1 and 4.1.2). In contrast, research providers were divided in their perceptions of the impact research was having on the incorporation of research findings into decision-making, strategic planning and policy. This may reflect the widely held perception that competencies and capacity in government are coming under increasing strain.

The impact WRC funded research can have depends to a large degree on the competencies and capacity within the participating organizations. Research provider perceptions suggest that the impact on institutional capacity of end users (partners) is less than one would desire. This is notwithstanding the belief among research users that WRC funding for research has had positive impact on the

availability of research users to build in-house capacity and the opportunities this creates for individual users to support in-house staff. One weakness seems to be that WRC funding is not sufficiently enabling for mentoring and there is a general perception that government in particular, needs to develop the competencies and capacity required to respond efficiently and effectively to emerging understanding. If the WRC is to realize its intent of being continuously relevant it must have greater organizational impact. To achieve this it has to develop innovative ways of facilitating, of being a catalyst, in the development of competencies and capacity within stakeholder organizations whether these are research providers, research users or research funders.

4.4 Economic and Health Impacts

When WRC research funding is directed at ecosystems research, as in the case of estuarine ecosystems, it provides by its very nature, often rather indirect economic and health impacts to society. Other research fields within the WRC, such as sanitation, agriculture or water services related research have a much larger direct role in providing economic and health impacts.

The economic and health impacts of estuarine research are thus achieved indirectly through the full institutionalisation mechanism and the manner in which it supports application of knowledge, planning and management, which in turn supports the delivery of a sustainable flow of ecosystem services. There is no doubt that WRC estuarine research programmes have created a significant awareness of the importance of estuarine ecosystems as a national asset which are of value to commercial fisheries, recreation, eco-tourism, genetic resource conservation, natural hazard regulation, transport and waste assimilation.

From a more academic perspective, WRC funding has supported a number of economic studies which developed and demonstrated valuation techniques in support of policy formulation.

Although research producers and research users consider that WRC funding for estuaries research has influenced the well-being of resource users, and some examples are provided (e.g. reducing pollution; allocating freshwater), this influence is generally implied and has yet to be researched. Consequently the impact of WRC funded research is difficult to assess. One apparent weakness is in economic research directed towards subsistence fisheries. Approximately 20,000 households, located for the most part in KwaZulu-Natal depend of estuaries as a prime source of household income, and are formally defined by MCM as subsistence fishing households. Very little work has been done by the WRC on the social-economic-ecosystem dynamics of these households and how estuary management affects the health and welfare of these households.

“But interestingly, now the formal structured estuary planning process has reached those systems (good) they are not finding it easy to deal with the core issues either and co-management and relations with users are viewed as equally important” Alan Boyd

The WRC support for estuaries research has positively and significantly raised appreciation for the value of benefits that are being or can be derived from estuary ecosystem services. It has also provided insight into some of the factors that constrain realisation of these benefits, particularly in the contexts of tourism and of Black Economic Empowerment. There is emerging appreciation that estuaries are common pool resources in which property rights are complex and generally poorly defined. This ambiguity confounds realising the potential of economic (including social) benefits

associated with estuaries and illustrates the need for a national strategy for estuaries research that is more holistic and integrated (see 4.3 above).

5. CONCLUSIONS AND RECOMMENDATIONS

Our conclusions and recommendations address the aims of this assessment as illustrated in the analytical framework presented in Table 1 and the context of the WRC mandate.

5.1 Overall conclusions

- The Water Research Commission has provided strategic direction and has been the principal funder for estuaries research for at least fifteen years. It must be largely credited with the credible scientific understanding and competence that has emerged in South Africa
- Estuaries research supported by funding from the WRC in particular, but also by the DWAF and NRF, has had a significant and positive effect nationally and locally on the management of estuaries
- The WRC approach to support for research is singular in that it has encouraged and provided opportunity for innovation whilst at the same time facilitating alignment with reality through feedback from managers

5.2 The impact of WRC funding for estuarine research and related activities on the social environment, economic environment and on health and welfare of the people in South Africa

5.2.1 Impact on social environment

- Water Research Commission funding for estuarine research has had a profound positive impact in the development and propagation of tacit knowledge about the structure, functioning and management of estuaries. It has achieved this by enabling research providers to collaborate and engage research users. The knowledge generated has had significant positive influence on national policy and approaches to managing the use of estuaries, including those under control of Transnet.
- The WRC through its reporting requirements and knowledge hub has been effective in making tacit knowledge explicit and accessible to a broad community.
- The WRC has been the principal funder for estuarine research and is well positioned to leverage support from other funders. Researchers enabled by the WRC have leveraged additional support from other sources (the NRF and private sector); the WRC appears not to have intentionally sought to leverage significant institutional support in estuaries research although it has done so in other programmes. This is perceived to have negative consequences in the long term as estuaries come increasingly under the influence of climate change (among others).
- The impact of WRC funded research is constrained by a weak ‘chain of custody’ for estuary management. To a significant degree this is considered to reflect competency and capacity weakness in government over a range of scales from local to national. It likely also reflects the complexity of property rights as they relate to estuaries.
- The WRC funded estuaries research projects are considered to be aligned with national priorities, despite perceptions that South Africa does not have a strategic plan for estuaries research.

The analysis exposes additional national priorities (such as institutionalisation and long term monitoring) that could significantly raise the impact of WRC funded research.

- WRC funded research has not been synthesised within a unifying context (e.g. social-ecological systems). Such a synthesis would make it easier to understand the social impact whilst providing direction for research (particularly in the social context) to enhance impact in the future
- Research excellence and professionalism have been positively influenced. However, as relatively little of the research is reported in cited journals, the international impact of South African estuaries research is limited.

5.2.2 Impact on economic environment

- The WRC support for estuaries research has positively and significantly raised appreciation for the value of benefits that are being or can be derived from estuaries. This has informed policy and stimulated engagement of estuary management.
- The economic impact of WRC funded research is constrained by the present narrowly conceptualised approach to socially oriented research on estuaries which needs to be more systems oriented and integrated.

5.2.3 Impact on health and welfare

- Improved health and welfare is the intent of research directed at sustaining estuary ecosystem processes and services, and of improving management of the use of estuaries. Although generally considered to be significant and positive, the influence on health and welfare has not been investigated.
- Estuaries have not been studied as complex social-ecological systems. Until they are we will not be able to adequately understand and the impacts of policy and management interventions on health and welfare.

5.3 The links between the WRC activities and those of other institutions, national and internationally

- Funding from the WRC has had a positive and significant influence on collaboration among Research providers based in academic institutions in South Africa.
- The strong focus on relevance, particularly for policy and management, has been a positive and significant motivating influence for Research providers and Research users to collaborate and engage stakeholders.
- The WRC has not actively sought to establish links with other institutions that could lead to cost effective collaboration in a national estuaries research programme
- Estuaries research funded by the WRC has a strong national orientation with minimal collaboration beyond national borders.

5.4 Meeting the WRC Mandate

Has funding for estuaries research contributed to meeting the WRC mandate (www.wrc.org.za)?

- The support for estuaries research has promoted co-ordination, co-operation and communication.
- The WRC identified the need for improved management South African estuaries and established this as a priority.
- The WRC stimulated and funded estuaries research according to priorities identified by research providers and national policy.
- Funding for WRC research on estuaries promoted effective transfer of information and technology.
- Funding for WRC research on estuaries enhanced knowledge and capacity building within the water sector and beyond.

Has funding for estuaries research addressed the WRC Impact Areas (www.wrc.org.za)?

- WRC funding for estuaries research has significantly and positively influenced researchers to respond to government policy particularly as it relates to the environmental Reserve
- WRC funding for estuaries research has had a significant, positive but mostly indirect influence on society through its contributions to policy and management.
- WRC funding for estuaries research has not had direct impact on the economy.
- WRC funding for estuaries research has had played the pivotal role in developing understanding of estuaries in the context of Water and the Environment in South Africa
- WRC funding for estuaries research has had positive but indirect influence on the link between Water and Health.

5.5 Recommendations

In addition to the suggestions made in Section 4, we make one recommendation that is specific to each term of the WRC mandate.

- **Promoting co-ordination, co-operation and communication in the area of water research and development**

The expectations society has of research can be achieved only when the domains of science, management, planning, policy and practice are interactively involved in issue framing, knowledge production and knowledge application.

It is recommended that the WRC encourage and support research into institutionalisation interventions aimed at strengthening the 'chain of custody' for estuaries in South Africa.

- **Establishing water research needs and priorities**

It is recommended that the WRC consider using a social-ecological systems framework to determine research needs and priorities and to develop an integrated national estuaries research programme that is also responsive to regional needs.

- **Stimulating and funding water research according to priority**

It is recommended that the WRC build on its relationships with DWA, SANBI and other agencies to establish partnerships and co-funding arrangements, refine the determination of priorities and to expand research on estuaries within the context of social-ecological systems

- **Enhancing knowledge and capacity-building within the water sector**

It is recommended that the WRC be more explicit in its expectations of research excellence and in so doing it should raise its expectations of research producers, requiring publications that are subject to peer review.

It is recommended that, and that the WRC encourages and supports institutionalisation interventions toward the development of the necessary competencies across the 'chain of custody' for estuaries in South Africa.

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7. ANNEXURES

7.1 Terms of Reference for a Targeted Solicited WRC Project (consultancy)

KEY STRATEGIC AREA : 2

THRUST :

PROGRAMME :

TITLE: Impact study of the estuarine research and related activities funded by the WRC

Objectives:
To assess the impact of the WRC estuarine research and related activities or roles.

General*:*
Impact assessment study of the research and activities of the WRC on estuaries.

Specific*:*

1. To assess the impact of the WRC estuarine research and related activities on social, economic, and health welfare of the people in South Africa;
2. To identify strengths and limitations of the previous and present research and activities of the WRC in estuarine management;
3. To identify links between the WRC activities and those of other institutions, national and internationally.

Rationale:
The WRC, especially the Water Linked Ecosystems Key Strategic Area, has been directly and indirectly involved in funding the research projects and other activities that generated knowledge about estuaries and their ecosystems. The WRC involvement enabled development of tools, methodologies and other innovations (including new ways of doing things) that are used to manage estuaries in South Africa and beyond our borders. The WRC would like to assess how its funding and involvement in estuarine knowledge generation impacted South Africa. The outcome of this study will assist the WRC in planning its future involvement and research agenda regarding estuaries.

Deliverables:
1. Report on the appropriate methodologies and techniques to be used in this study.
2. The impact assessment report that fully addresses the objectives stated above.
3. Draft final report.
4. Final report

Time Frame:
6 months

Total Funds Available:
R200 000

7.2 Stories

7.2.1 Prof. Guy Bate: Reflections on Research with the Water Research Commission, Botany Department NMMU and CERM

My first research on returning to South Africa from what was then the University of Rhodesia, was with the Botany Department at the University of the Witwatersrand. My main research at Wits was with the Co-operative Scientific Programmes administered by the CSIR. This was a completely terrestrial programme with research being undertaken at Nylsvlei in the *Burkea africana* savannah, Limpopo. My attention was on nitrogen cycling in the soil and water relations in the vegetation.

In 1981, I joined the staff of the Botany Department at what was then the University of Port Elizabeth (UPE), (now Nelson Mandela Metropolitan University, NMMU). One of the primary functions with which I was tasked on taking up this appointment, was to provide botanical backup to support what were then vigorous marine, estuarine, coastal dune, zoology, geology and pollution research programmes.

First research on the list was the surf-zone diatom 'problem' that manifested itself in what visually appeared to be black 'oil patches' just inside the breaker zone, but subsequently turned out to be dense accumulations of a surf-zone diatom (*Anaulus australis)*. This work was initially undertaken by students who had followed me from Wits or had arrived as post graduate students from the University of Cape Town. One of these first students opted to work in an estuary environment. (Hilmer, T. 1984. The primary production of different phytoplankton size fractions in the Swartkops Estuary. MSc dissertation, University of Port Elizabeth. 150pp). This was the Botany Department's entry into estuary research and it was funded at that time from a block research grant from the South African Department of Environment Affairs and Tourism to the UPE, Institute for Coastal Research. Shortly after this, a connection was started with funding from the Water Research Commission on diatom research in both estuaries and rivers. Since those early days, the Botany Department has undertaken research for the Water Research Commission on a continual basis in some form of estuary research in both microalgae and macrophyte vegetation.

Students have formed the core of the manpower used in the water research undertaken by the Botany Department and there has been a continuous flow of BSc (Honours), MSc and PhD theses over the years. Many of the students supported by WRC funds have gone on into environmental management. Much of the research output has been published in the international literature, but from a South African perspective, probably the most important component has been research that has been incorporated into the Resource Directed Measures (RDM) programme of the national Department of Water Affairs.

Before the Botany Department began research on the primary producers, estuary research had been dominated by studies on fish with some smaller effort put into invertebrates. Today we realise that the microalgae are at the root of primary production in estuaries and that they are responsible for about 95% of all food production consumed by heterotrophs. Much has been achieved but much remains to be done in order to have a thorough understanding of estuarine plants and how estuary management can influence their ecology.

One of the great features of the research support received from the Water Research Commission has been the ability of aquatic scientists from different disciplines and different institutions to collaborate

on single projects. This has vastly improved the common understanding that each discipline has concerning the holistic estuarine environment. It has resulted in many ideas for research that are unlikely to have emerged had there not been such co-operation. A recent example of this co-operative research is the project on the temporary open/closed estuaries in the Eastern Cape. Here, researchers and post-graduate students from the South African Institute of Aquatic Biodiversity, Rhodes University, NMMU, University of Cape Town and the Council for Scientific and Industrial Research (Stellenbosch), collaborated on all aspects of the work undertaken. One of the results was the publication of a multi-authored and multi-institutional scientific paper. In addition, there were many other specialist publications.

An outstanding feature of research with the WRC is their use of annual steering committees to guide progress and the concept of 'deliverables'. Steering committees provide needed criticism, ideas and support to the research team. The committees are made up of specialists in the field, and, apart from the input that they can provide from a scientific point of view, they also constitute on a great many occasions, a support base for the researcher. This is important for experienced researchers but is vital in the case of young scientists entering the research milieu. The implementation of 'deliverables', I believe, is a very important innovation, which I first came across with WRC projects. The reason that these 'deliverables' are so important is that during the development of the proposal, the discipline of the deliverable in terms of time and value forces the proposer to think very clearly about output. This is very valuable in research because it forces the proposer to pay a lot of attention to the hypothesis surrounding the proposal.

One most important outcome emanating from WRC support of estuary research has been the formation of the Consortium for Estuarine Research and Management (CERM). CERM was started in the 1980's by a group of dedicated estuary scientists as a forum that would foster liaison between researchers from different disciplines. CERM still exists today, more that 10 years after it was conceived and it survives largely as a result of the interdisciplinary research supported by WRC. CERM's survival was possible as a result of research support but also, in the early days, as a result of a very small grant that paid for immediate expenses. There has never been any membership fee and, without the internet and email, which emerged just in time, CERM might well have died.

7.2.2 Dr Alan Boyd, Department of Environmental Affairs

Unlike many of the people involved in estuary research and management, who seem to have spent much of their professional lives dealing with estuarine issues, in late 1999 I was quite suddenly "thrown in the shallow end" from my previous focus on oceanography and fisheries.

This happened when estuary management became a responsibility of MCM with the Marine Living Resources Act of 1998, based (I was informed) on the dependence of many key line fish species on both estuarine and marine environments, and thus the need for an integrated approach to management. At the same time other legislation and policy was also dealing with estuaries, in particular the National Water Act, which made very good provision for integrated management of water resources, as well as the White Paper for Sustainable Coastal Development, now the Integrated Coastal Management Act, which dealt with the whole coast. So there was a whole new set of "mandated role players" (top down) and things needed to be co-ordinated. This "co-ordination" was a key focus of the National Estuary Workshop in 2000 (supported by WRC staff), but also the EC Estuaries Management programme of the WRC, which began by addressing matters the other way around, from the bottom up. Fortunately the two approaches have fairly regularly met in the middle.

In my own case and also quite probably because estuaries are a focus for many other key issues, MCM always managed to give me additional tasks related to these issues. In fact these usually ended up overshadowing the estuary work for substantial periods. Firstly there was Subsistence Fishery Management (estuaries are the locality for 20% of subsistence harvesting – according to the Subsistence Fishery Task Group (SFTG) papers of 2002) and secondly Marine Protected Area Management. The subsistence fishery management tasks resulted in largely applying general recommendations of the SFTG to harvesting in estuaries, but also in establishing effort limits for species or sectors (not done by the SFTG) and we undertook certain interventions which were probably at best "co-management holding operations" – for example at the Swartkops and Olifants Estuaries. But interestingly, now the formal structured estuary planning process has reached those systems (good) they are not finding it easy to deal with core issues either and co-management and relations with users are viewed as equally important. A key accomplishment was sticking to the phasing out of gillnetting nationally in all but the Olifants Estuary – although in some areas this remains an achievement on paper only. Other work such as at the BENEFIT Orange River Estuary study was also valuable - with a strong scientific component finding out from virtually a zero-base of knowledge (in 2003) how the mouth of SA's biggest river functioned. Studies on many of these systems both contributed to, and were focused by, the WRC Biodiversity Importance rating reports at the high level. Planning was supported by co-management approaches and the then unofficial formation of Estuary Management Forums at the ground level at some sites. But to get back to the SFTG it was absolutely right in allocating only 20% of subsistence activities to estuaries, which meant that during the period 1999 to 2002 (and partially to 2004), 80% of my job was managing subsistence activities outside of estuaries, from west coast rock lobster to mussels. A key common thread was the meeting of users, and listening to them, and then aiming for sustainability – nothing more, nothing less. Unrealistically high numbers of fishers were opposed, but so were unrealistically low numbers which were sometimes put forward – in the guise of applying the precautionary principle. [What is not said about support to this initiative?]

Protected Area Management was my next parallel challenge – and here my approach of listening to the human users has got me in situations of quite strong tension – as paying inadequate attention to the other "users" of protected areas, namely the animals and plants that occur there, which in the eyes of conservationists and many biodiversity researchers are the true users and should be the primary beneficiaries of such areas.

But returning to estuaries - during all these periods where I had another main focus - the constancy through which the WRC continued to initiate and support estuary research was a touchstone for me, as through serving on various Steering Committees and attending key workshops, I could stay abreast of advancing matters and support co-ordinated activities. And more recently I got staff to both do this and to get more involved in the on-site planning as well. Here the CAPE Estuaries programme added both focus and a capacity to implement – and it deserves high accolades. If I can claim anything it is that about 5 years ago I managed to secure adequate DEAT funding to see it through the initial 2-3 years.

But despite all the recent progress, with 20 estuary management plans in various stages of completion, and a workable generic framework guiding their preparation, matters are coming to a head. Much of the research that has lead management planning (including the ICM Act and its requirement for estuarine management plans) needs to supported by the lead national organizations really getting stuck in on the management level - to meet the readiness shown by Provincial agencies, society and (recently) local government too. In fact if we don't get ourselves in gear and get a full tank of funds we will in fact be the weakest link.

For a key part of this we can fortunately still rely on the WRC as the “Anchor tenant of the Estuary Management Mall”, to continue to provide research products which have given impetus to new directions as well as providing support for already identified management needs.

7.2.3 Duncan Hay: The Eastern Cape Estuaries Management Programme – a case of infectious transfer, UKZN.

In 1998 Mr Piet Odendaal the then CEO of the Water Research Commission and Professor Charles Breen, the then CEO of the Institute of Natural Resources, met and agreed. They agreed that the estuaries of the Eastern Cape were important assets and that to ensure that they retained their value to society they required active management. They infected each other with a shared understanding and, with this, a shared enthusiasm!

And, so began the Eastern Cape Estuaries Management Programme. The programme commenced with two activities: a WRC research project was initiated aimed at identifying the estuary management issues encountered on the Eastern Cape coast, and a political launch of the Programme took place in Port Alfred. These were the second and third infection points.

The political launch received some press and stakeholders began contacting the programme team with issues that were important to them at their estuaries. It was immediately apparent that Eastern Cape stakeholders were passionate about ‘their’ estuaries so infection was bi-directional – from the programme team to stakeholders and from stakeholders to the programme team – the commitment and enthusiasm was mutually reinforcing.

So as to identify the estuary management issues the research team engaged ‘estuary managers’ at local and provincial level in a series of workshops. These managers were encountering issues on a daily basis – illegal jetties, over-harvesting, development applications – and did not know how to deal with them. The workshop provided them the opportunity to air their views and to receive support. They were ripe for infection.

But, it was not only local stakeholders, and provincial and local government who became infected. A very important infection point was national government, specifically staff of the Marine and Coastal Management in the then Department of Environmental Affairs and Tourism. They identified estuary management issues in the Eastern Cape that required action. As examples, the illegal fishing at Mtentu and the harvesting of mangroves at Mngazana were of concern. They commissioned the programme team to support management efforts at these and other systems and became directly involved in project implementation. They were infected and carried the infection to other coastal areas. Also, there was continual re-infection between research and application.

The research progressed, involving researchers from KZN, the Eastern Cape and the Western Cape. This spread the infection. The KZN researchers and consultants were asked by the KZN Coastal Committee to develop a framework and strategy for estuary management in the province. Quite naturally it was based on what had been developed in the Eastern Cape. Researchers and government in the Western Cape took the same work and used it as the foundation for the C.A.P.E Estuaries Programme.

What else assisted the spread of the infection? In 2003 the programme won the overall award for the best project in the established project category of the Green Trust Awards. This provided national

recognition and a whole new group of strategic stakeholders were infected. Also, as the research reports rolled out they were complimented with a whole series of user-friendly guides that were accessible to the lay person. The first guide *Managing Estuaries in South Africa: An Introduction* was translated into isiXhosa and isiZulu and so reached a whole new audience. Over one thousand of these handbooks were distributed by one WRC funded project in the course of its fieldwork. Infection was rampant! Finally, one of the products of the research process was an estuary management training course. This course has now been run on numerous occasions in the Western and Eastern Cape, and KZN. It is continually infecting a large audience.

Recently we have been researching estuaries as catalysts for economic empowerment. This is in recognition of the observation that, despite 15 years of democracy, disadvantaged people living at or near estuaries continue to be sidelined in economic development. Economic empowerment is topical and is supported by the new Integrated Coastal Management Act. MCM staff members are looking to us for guidance on how economic empowerment might be supported in a coastal and estuaries context. They remain ripe for infection with the latest strain of the bug!

It is clear from this brief description that the information contained in the programme has spread rapidly far and wide. Its influence has far exceeded its original intent and scope. It has not been a trickle down or osmotic flow; it has had momentum. What might be the attributes of the programme that have contributed to this momentum and contagious infection? In no particular order of importance here are some thoughts: Estuary management is complex but the programme is founded on a very simple, and readily absorbed and shared message – the estuaries of the Eastern Cape are important and they require our collective management attention. Gathering information and sharing information was not an explicit goal of the programme; it was the programme. Infecting, being infected and re-infecting were day-to-day activities implicit in everything we did. The programme has operated for an unbroken spell of twelve years (and has received funding from the WRC for all of those twelve years). It has morphed several times and its character has changed but at the same time it has been a constant force. This has generated a certain respect and acceptance of what it has delivered, and what it continues to deliver.

Its ongoing research and linked application has meant that it has never receded from the public eye into an 'ivory tower'. It has always been 'out there' in the public domain. It has attempted to listen to and be responsive to stakeholders' needs and concerns. In this way it has always been relevant to stakeholders. In the coastal management sector we were the only group out there 'selling' a fairly coherent management message. Our message might have been wrong but there was no contradictory message and there was nobody else to listen to. We are not in a position to comment on the quality of the leadership and management of the programme as we are the leadership and the management. What we can say is that a consistent core group has been together for the duration of the programme. This might appear arrogant but we have also developed a certain confidence in our operation. We think we know what we are doing.

Given their positions and authority in their respective organisations the initiators of the programme were able to 'infect' their staff with a common understanding and enthusiasm. The programme has always been in 'exploration mode' which has kept it interesting for both team members and stakeholders. There has always been something new to infect or re-infect people with. Particularly on the Wild Coast we met a stakeholder base deprived of education, knowledge and opportunities to participate. People were thirsting for knowledge and hungry to contribute. We satisfied that need and at places like Cwebeni, Mngazana we continue to do so.

In almost all of our engagements with stakeholders we have prepared well. We have been organised and directed, knowing what we wanted to accomplish and how we were going to accomplish it. The positive response of stakeholders can often be attributed to the respect generated by this level of focus.

Finally, there have been times when the programme has felt a bit like a campaign; a campaign that has adapted changing priorities and perceived needs. Campaigns by their very nature have high infection rates but the infection is short lived. We have, I think, managed to capture the enthusiasm of a campaign and combined with the resilience of a programme.

There are many things we might have done better: We have failed miserably to infect the corporate sector and the 'captains of industry'. This despite the fact that many of these industrialists have their holiday homes at estuaries. Cracking this sector would have meant more influence and more funds.
The research process could have been far more creative. WRC would allocate us funds to conduct a research project. We, in turn, would commission researchers to develop specific research products. The researchers would then 'disappear' for awhile and then 'reappear' to present their findings, sometimes having ignored their brief or they simply cobbled together existing work. We should have facilitated much more structured interaction (and re-infection) between researchers. In our current work (estuaries and economic empowerment), involving researchers who are geographically closer to each other and are able to meet regularly to brainstorm has improved the process and the products.
In the early stages of the programme a large number of post-graduate students were involved but this tapered off. I think the main reason for this was that, while in the beginning the research was conducted within universities with easy access to students, it later became centred in consultancies with limited access to students. So our infection rates into new professionals diminished. This is disappointing because those graduates I interact with who were involved early on speak of the programme with great respect and affection. We produced very few peer-reviewed publications. I think part of the reason for this was the same as the reason for diminishing student intake. Within a consultancy there is limited incentive to publish – you write a report, get paid and move on. So, our infection of the academic and research arena was limited.

There are a number of constituencies we might have served (or infected) more effectively. But, overall, I sense part of our success was because we infected three constituencies well: Members of society with an interest in the management and conservation of their estuaries. Provincial and national government officials who wanted what we were/are delivering and had the ability to and interest in spreading it further. Last but certainly not least, we infected each other with new ideas and new enthusiasm. This was critical to maintaining interest over the long term.

7.2.4 Dr. Steve Mitchell, former Research Manager, WRC.

Estuaries have long held a special place in my life. As a young angler, I found them consistently more productive than the sea and I always found them more attractive. Our family holidays centred on estuaries long before I had the opportunity to work on them. Estuaries are fragile ecosystems which are also highly desirable places to live and there has been a good deal of development centred on estuaries. Although people recognised that estuaries were important components of the landscape both ecologically and for development, there was not a lot of support for research on these areas. In spite of this, some far-sighted researchers had developed the Consortium for Estuarine Research and Management (known as CERM) which was an informal and open network to which anyone interested in estuarine research and management could belong.

When I took over the portfolio of research into aquatic ecosystems at the Water Research Commission (WRC) in 1994, estuaries largely fell between the inland waters and the marine research, and were not receiving much research attention. Amongst the changes that occurred with the inauguration of the post-apartheid government in this year were two which raised the profile of estuarine research and the WRC decided to step into the gap and fund the work. The first of these was the development of the concept of an ecological reserve whereby sufficient water should remain in a river to maintain ecological processes and the second was the over-exploitation of the natural resources in the estuaries and coast of the Eastern Cape, with considerable media attention being given to the stripping of the black mussels from the rocks in the Dwesa Nature Reserve by local residents, resulting in considerable friction with the authorities.

Work on the environmental water requirements (EWR) of rivers started in the late 1980s, but understanding of this aspect of estuaries was in its infancy. The obvious place to start with the challenge of determining the EWR for estuaries was with CERM and the CERM members were always a great help in identifying the necessary research steps in the search for legally acceptable methods, and the ecological understanding needed to underpin these, for the determination of the EWR. This research programme involved researchers from most of the organisations active in research into estuaries. This work addressed not only the biological aspects of estuaries but also physical aspects (including hydrology) and socio-economic aspects. The way in which the researchers worked together led to a good integration of the various disciplines and this has resulted in the development of a robust holistic method for the determination of the EWR for estuaries. Methods developed within this research thrust have been taken into the general methods for the determination of the ecological reserve by the Department of Water Affairs (DWA) and have been implemented nationally. Aspects of this research have also been taken into policy by Marine and Coastal Management (Department of Environmental Affairs) for the management of estuaries. The knowledge developed has also been incorporated into courseware, and these courses have been widely presented both under the auspices of CERM and FETWater (Framework for the Education and Training in Water). This research thrust was based on the need to implement Chapter 3 of the National Water Act of 1998.

Unlike the determination of the reserve, the research thrust into the conservation of estuarine resources of the Eastern Cape was initiated by the WRC in recognition of the potential value of these estuaries to provide sustainable livelihoods through the ecotourism industry and at the same time the fragility of these systems in the face of uncontrolled exploitation. This research thrust focused on the socio-economic aspects of these estuaries, but was underlain by a substantial body of ecological research. Throughout the duration of this research, considerable energy was put into engaging local government through their Integrated Development Plans (IDP), as required from each municipality by the Department of Provincial and Local Government. The IDP should include protection of the environment. This knowledge was encapsulated in courseware, and these courses have been presented to a number of local authorities. While research findings were successfully transferred to the larger local authorities with the capacity to implement the knowledge, it was found much more difficult to embed the knowledge in the smaller municipalities which did not have the capacity. The outputs from this research thrust are being transferred to the understanding of sustainable livelihoods for communities using wetlands.

I have really enjoyed my time working with the estuary researchers and managers. They have, without fail, been keen and positive over their work, and the results that have been achieved.

7.2.5 Prof. Alan Whitfield, South African Institute for Aquatic Biodiversity

My first association with the WRC and its involvement in estuaries was when I served on the steering committee of a UPE (now NMMU) project on the salinity tolerance of estuarine plants. Later, I served on another UPE based WRC steering committee that dealt with the development of a Botanical Importance Rating for estuaries in the former Ciskei and Transkei. These early meetings revealed to me that the WRC was not simply interested in riverine, lacustrine and other freshwater studies but was prepared to support research at the interface between rivers and the sea.

My first 'deliverable' to the WRC was in fact the production of a bibliography on formal and informal publications from South African estuaries. This report (No. 577/1/95) was produced on behalf of the Consortium for Estuarine Research and Management (CERM) and was part of a broader project on Decision Support for the Conservation and Management of Estuaries. The bibliography was designed to provide estuarine scientists, planners and managers with a comprehensive aid to research information on South African estuaries in general and specific references for more than 250 systems around the coast. This bibliography was subsequently updated and republished by the WRC in 2000 (Report No. 577/3/00).

CERM continued to be the 'vehicle' for my involvement with the WRC and in the late 1990s I led a team of estuarine scientists who focused their research in the upper reaches of selected permanently open estuaries in the Eastern Cape. The aim of this WRC project was to increase our knowledge around what became known as the river-estuary interface (REI) region. The scientific team was able to determine that the REI is a distinct region of these large estuaries and does indeed influence the physico-chemical and biological functioning of the entire system. The WRC Report (No. 756/1/03) arising from this project was very well received and led to a number of cutting edge scientific papers in the primary literature.

The above project did, in fact, sow the seeds for my next project involvement with the WRC. Between 2006 and 2009 I led a CERM driven project on intermittently open estuaries (IOEs) in the warm temperate biogeographic region of South Africa. A primary goal of the research was to determine the principles that underlie the freshwater requirements of IOEs along the Eastern and Western Cape coasts. These small estuaries, which had been neglected in terms earlier research around our coast, are important as nursery areas for both fish and aquatic invertebrates such as shrimps, prawns and crabs. It was also realized that an improved understanding of the link between river, estuary and the sea will assist the Department of Water Affairs with fresh water allocations to these vulnerable ecosystems. Two WRC reports (No. 1581/1/07 and 1581/2/08) were produced, along with a large number of postgraduate students and scientific publications, all of which have served to focus our attention and elevate our knowledge of IOEs in the warm temperate region. In an effort to communicate that knowledge to the public, a popular booklet sponsored by the above project is about to be published and will be distributed free of charge to coastal managers, schools and interested members of the public.

My most recent involvement with the WRC is leading a 2010 workshop on synthesizing research information from the Mfolozi/Msunduzi Estuary and discussing how this knowledge can be used to facilitate the re-linking of that estuary with Lake St Lucia without causing major sedimentation problems for the system. Once again, a WRC report on the proceedings of workshop will be produced and we are hopeful that this initiative will provide the trigger that leads to the recovery of the most important estuarine ecosystem on the subcontinent.

In conclusion I must emphasize the pivotal and supportive role of the WRC chairpersons in guiding the research that I have been privileged to be involved in for more than 20 years. These individuals included Dr Peter Reid, Mr Charles Chapman, Dr Steve Mitchell and Dr Stanley Liphadzi, all of whom have understood that freshwater is vital to estuarine functioning. Indeed, if it was not for their commitment to broadening the funding mandate of the WRC to include estuaries, the wealth of knowledge that has been accumulated over the past three decades would not exist.

7.2.6 Interview notes

Interview 1

- Need to fund a systems approach that acknowledges the continuum from freshwater to the near shore marine environment
- WRC has a programmatic approach but is not set up to support near shore research even when this has direct relevance to freshwater. This was demonstrated in the EIA studies on the Tugela funded by DWAF. How is it that DWAF acknowledges the linkage but WRC is not able to support research on the linkage or even leverage other funding (SANCOR or MCM) to make this possible
- Estuaries research needs to be better structured into Integrated Water Resources Management
- WRC has been the number one supporter of estuaries research
- The programmatic approach has many advantages but it does result in grants to individuals that are small, making it a challenge to achieve the necessary results within the budget
- Despite its support for research programmes, it is very difficult to sustain data collection (to establish long term data sets)
- SAEON (South African Environmental Observation Network) Elwandle node does not adequately incorporate/connect rivers, estuaries and the marine environment
- To enable researchers to achieve the standards required by their institutions, it is necessary to cross-subsidize WRC grants. This encourages researchers to engage in contract work (consulting) such as with the reserve determinations
- The emphasis on contracts detracts from attaining the standards required by academic institutions
- SACOR (South African Committee for Oceanographic Research) managed through the NRF, promoted collaboration with estuary researchers some time back but this no longer happens. The relationship is competitive making it difficult to collaborate on research in the near-shore environment
- Science has become more ‘political’
- Research has become competitive around funding with adverse consequences for collaboration. WRC needs to take the lead in developing a 10 year vision
- Estuary researchers in RSA are isolated within Africa and this should be addressed in the vision and strategy
- Research is losing its attraction as a career as it becomes more ‘consultancy driven’
- There is a tendency to ‘micro-manage’ particularly in respect of finances which affects science discourse
- There is a need to develop a strategic vision for estuaries research in RSA; a vision that is founded in theory and not necessarily by funding; a vision that incorporates regional research institutes
- WRC encourages good synthesis products in addition to scientific papers

Interview 2

- Estuaries research funded by the WRC initially the E Cape Estuaries Management Programme and DWAF (Reserve determinations) has had considerable impact for the management of estuaries. It has also had an important role in influencing legislation
- NRF bursaries have combined with WRC funding
- WRC funding has been very influential in promoting multidisciplinary, integrated research
- NRF funding constitutes perhaps less than 20% of funding for research on estuaries leaving WRC as the major funder
- Publishing (in peer reviewed journals) has suffered from 'consultants posing as researchers and not publishing'
- WRC does not measure the quality of publications
- While synthesis reports are produced there is scope/need for reports that integrate across projects/programmes and reflect growth in understanding over a number of years e.g. books
- WRC funding has had a very positive role in fostering collaboration among researchers with interests in estuaries. 'Virtual' institutes have emerged but they are vulnerable and need more directed support
- Research generally but perhaps particularly in estuaries, is losing ground in the emerging socio-political context. Research chairs would help to raise the profile
- Universities commonly fill vacancies without taking enough cognizance of the need to sustain a group or the institution's reputation for research in particular fields
- The format of solicited and non-solicited proposals helps to provide opportunities for individual innovation and strategic research. The formulation of the briefs for solicited proposals may be less strategic than it could/should be.

Interview 3

- WRC support for the Consortium for Estuaries Research and Management (CERM) has had a profound influence on collaboration and integration of research over a number of years. It has spawned collaboration within the E Cape and between E Cape and KZN
- The E Cape Estuaries Management Research Programme that developed guidelines for estuary management by a team drawn from institutions across the country has had a major influence on approaches to estuary management in the Cape (Cape Estuaries Programme) and has spawned collaborative courses for estuary management
- Estuaries are interfaces between rivers and the sea and to really understand their roles we need a bigger vision for research that also considers the near shore environment
- The Tugela Reserve EIA funded by DWAF exposed the importance of understanding rivers/estuaries/sea as a connected system. The role of fresh water in the marine environment is only now beginning to be really appreciated
- Marine Coastal Management (MCM) potentially has a very important role in co-funding with WRC for research on the role of fresh water in the marine near shore environment, but unfortunately the current situation seems to be chaotic with little scope for optimism
- The WRC model for funding research is very flexible and allows researchers to draw on consultants when they need particular expertise
- The WRC research funding system is flexible in that it allows researchers to define their deliverables and secure release of funds against these.
- The WRC research management system using reference groups works well

Interview 4

- There is no system for an estuaries data base that will enable understanding/prediction of long term changes in estuary structure and functioning.
- Research on long term cycles are not given any priority.
- Without long term research we will not be able to appreciate whether the tools that are developed actually deliver what is intended
- There is no support for monitoring to see if the tools really work (the Reserve for example)
- The WRC is flexible and responsive enabling researchers to study unanticipated, episodic events (the Knysna floods were an example)
- Much of the support for research is managed through consultancies. Very little institutional support for the longer term research
- Much of the WRC funding is published as reports which for the WRC are 'end products' and does not lead to peer reviewed papers
- Need to grow the longer term programmatic approach. This would require a different mix of site based and concept based research. Site based research would provide a platform for longer term collaboration in a cost effective manner. The example used to illustrate this was the cost of near shore research and the need for WRC funded research to leverage from initiatives such as SAEON and particularly the Elwandle node
- WRC funding for estuaries research has had a very positive influence on cooperative research. Estuary researchers are congenial and work together in a very positive way to achieve support for integrated ecosystem study and for supporting the Reserve determination process. It is a great paradigm for cooperation.
- The Reserve Tugela study was a good example but it also exposed the need for research on estuary/marine interactions
- The research manager (Steve Mitchell) allowed space for researcher initiative and did not attempt to direct research
- The WRC funding approach was a nurturing approach and this has had a very good impact
- Particularly because of growing appreciation for the fresh water marine interactions it is very important that the WRC and MCM (and NRF) sort out their roles and enable collaboration. But generally there seems to be need for greater interaction and collaboration with government departments
- Science seems to be losing ground. We need a vision for science
- We are in 'real trouble' with sustaining the interest in research as a profession. The WRC and other institutions need to 'get serious' about transformation. We need to make it attractive and we need to establish funding systems that support mentorship
- NRF appears to exert too much pressure for three year graduate degree. Measuring the wrong thing?

7.3 Respondents

The respondents are shown in the following table according to whether the categorised themselves as Research Provider (RP), Research User (RU) or Funder (F).

Respondent Name	Institution	Type of response	E-mail
A.T.Forbes	Marine & Estuarine Research/Honorary Professor UKZN	Provider and User	ticky@mer.co.za
Aidan Wood	Consultant	Research User	tagfish@telkomsa.net
Alan Whitfield	SA Institute for Aquatic Biodiversity (SAIAB)	Research provider	a.whitfield@saiab.ac.za
Andrew Mather	eThekwini municipality	Research User	mathera@durban.gov.za
Ayanda Matoti	DEPARTMET OF ENVIRONMENTAL AFFAIRS	Research User	amatoti@deat.gov.za
Bruce Mann	Oceanographic Research Institute	Research provider	bruce@ori.org.za
Donovan Kotze	University of KWaZulu-Natal	Provider and User	kotzed@ukzn.ac.za
Dr Nadine A. Strydom	Nelson Mandela Metropolitan University	Research Provider	Nadine.Strydom@nmmu.ac.za
Duncan Hay	University of KwaZulu-Natal	Provider and User	hay@ukzn.ac.za
G C Bate	Botany NMMU	Research Provider	guy.bate@nmmu.ac.za
Ian Bickerton	Iain Bickerton Consulting Estuarine Ecologist		ibickert@saol.com
Janine Adams	NMMU	Research Provider	janine.adams@nmmu.ac.za
Jenny Rump	Zwartkops Trust	Research User	zwartkops.trust@iafrica.com
Jenny Whitehead	iRAP (Consultant)	Research User	irap@worldonline.co.za
Landile Jack	Department of Water Affairs	Research User	jackl@dwa.gov.za
Lara van Niekerk	CSIR	Research Provider	lvnieker@csir.co.za
Myles Mander	eco-futures	Research Provider	myles@eco-futures.co.za
Margaret McKenzie	Consultant	Provider and User	margaret@eject.co.za
Martin de Wit	de wit sustainable options	Research Provider	martin@sustainableoptions.co.za
Michelle Boshoff	Private Sector - Mining	User and Funder	Michelle.Boshoff@rbm.co.za
Nicolette Forbes	Marine and Estuarine Research	Provider and User	nicolette@mer.co.za
Pierre de Villiers	CAPE Estuaries Programme	Research User	estuaries@capenature.co.za
Piet Huizinga	Pensioner, previously CSIR	Research Provider	p.huizinga@adept.co.za
Prof D.P.Cyrus	CRUZ, Department of Zoology, University of Zululand	Research Provider	dcyrus@pan.uzulu.ac.za
Rebecca Bowd	CEAD	Research Provider	rebecca@greendoorgroup.co.za
Renzo Perissinotto	University of KwaZulu-Natal	Research Provider	perissinottor@ukzn.ac.za
Ricky Taylor	Ezemvelo KZN Wildlife	Research User	taylorr@kznwildlife.com

Respondent Name	Institution	Type of response	E-mail
Santosh Bachoo	Ezemvelo KZN Wildlife	Research User	bachoos@kznwildlife.com
Stefan Schmidt	Professor	Research Provider	schmidts@ukzn.ac.za
Stephen Hosking	NMMU	Research User	stephen.hosking@nmmu.ac.za
Steve Mitchell	ex WRC	Funder	steve.mitchell@bufo.co.za
Tandi Breetzke	SSi Engineers and Environmental Consultants	Research User	tandib@ssi.co.za
Taryn Riddin	Botany Department, NMMU	Research Provider	triddin@isat.co.za

Respondents who were interviewed or provided a personal reflection.

Respondent	Institution	Type of response		Category
		Interview	Reflection	
Adams, Janine	NMMU	+	+	Research Provider
Bate, Guy	NMMU and CERM		+	Research Provider
Boyd, Alan	MCM		+	Research User
Hay, Duncan	UKZN		+	Research Provider
Kaniki, Andrew	NRF	+		Research Funder
Le Roux, Renee	NRF	+		Research Funder
Mitchell, Steve	Formerly WRC		+	Research Funder
Patterson, Angus	SAEON	+		Research Provider and User
Whitfield, Alan	SAIAB	+	+	Research Provider
Wooldridge, Tris	NMMU	+		Research Provider

7.4 Mailing List

Historic and current databases were accessed to develop the list of potential respondents. Because the questionnaire was also advertised through the mailing lists of the Consortium for Estuary Research and Management and the South Africa Association for Aquatic Science, it will have reached persons of whom we are not aware. The following table provides the list of potential respondents

with whom we sought to establish direct communication and to whom reminders were sent. The category listed was our assumption of how they might have designate there function.

Region	Name	Category	Contact
KwaZulu-Natal			
	Allan, Sarah	User	Contact details: *Tel..* Email: sarah.allan@kzndae.gov.za
Durban	Archibald, Colin (Dr)	Researcher	carchibald18@telkomsa.net
	Bachoo, Sanchos Conservation EKZN	User	Email: bachoos@kznwildlife.com
	Blackmore, Andy Conservation EKZN	User	Email: andyb@kznwildlife.com
Howick	Bate, Guy (Prof.)		Contact details: *Tel: +27 [0]33 003 5252, Fax: +27 0866581161, Cell: 0825625838 .* Email: dem@telkomsa.net; bategc@gmail.com; Guy.Bate@nmmu.ac.za
Durban	Bickerton, Iain Consultant	User	Position and address: *Consulting Marine/Aquatic Ecologist, 9 Lynden, 97 Lambert Road, Morningside, DURBAN, 4001, SOUTH AFRICA.* Contact details: *Tel. +27 [0]31 3123085, Fax +27 [0]31 5637987, Cell. +27 (0)83 6609400.* Email: ibickert@saol.com
Richards Bay	Boshoff, Michelle		Michelle.boshoff@rbm .co.za
Hilton	Bowd, Rebecca	Researcher/user	Contact details: *Tel. +27 [0]33 342 8250, Fax. +27 [0]33 342 8261,* *Cell +27[0]72 181 4236* Email: rebecca@greendoorgroup.co.za
	Breetzke, Tandi	User	Contact details: Tel 033 355 9434 Cell 082 8020946 Email:Tandib@ssi.co.za
Pietermaritzburg	Coke, Mike	User	mdcoke@futurenet.co.za
Durban	Connell, Alan	Researcher	Contact details: *Tel* Email: allan.connell@yahoo.com
Empangeni **A**	Cyrus, Digby (Prof.)	Researcher	Contact Details: *Tel: +27 [0]35-7933911 ext. 2063 Fax: +27 [0]35-7933162Cell: 082-4559197* Email: dcyrus@pan.uzulu.ac.za; cyrus@iafrica.com
	Daniel, Craig	User	Craig.Daniel@sappi.com
Durban	Demetriades (now Forbes), Nicolette	Researcher/user	Contact details: *Tel/fax +27 31 260 3183* Email: nicolette@mer.co.za
Pietermaritzburg	Dickens, Chris (Dr)	User	dickens@ukzn.ac.za

Region	Name	Category	Contact
	Dold, Di	User	Contact details: *Tel:*031 2013126 Conservation@wessakzn.org.za
Durban	Fennessy, Sean (Dr.) ORI	Researcher	Contact details: *Tel. +27 (0)31 3373536, Fax. +27 (0)31 3372132* Email: seanf@ori.org.za
Richards Bay	Fischer, Duane Industry	User	Contact details: *Tel. +27 [0]35 901 3493, Fax. +27]0]35 901 3135* Email: duane.fischer@rbm.co.z
Durban	Forbes, Ticky (Prof.) Consultant	Researcher/user	Contact details: *Cell: 082 451 8078* Email:ticky@mer.co.za
St Lucia	Fox, Caroline Conservation	User	Contact details: *Tel. +27 035 5901436, Fax. +27 035 5901343* Email: foxc@kznwildlife.com
Pietermaritzburg	Goodman, Peter (Dr. Conservation	User	Contact details: *Tel. +27 033 845 1423,* Email: pgoodman@kznwildlife.com
	Goss, Pat Developer	User	Contact details: *Tel..* Email: pgoss@iafrica.com
Durban	Govender, Anesh (Dr.) ORI	Researcher	Contact details: *Tel. +27 [0]31 3373536, Fax. +27 [0]31 3372132.* Email: seaworld@dbn.lia.net
Pietermaritzburg	Graham, Mark Consultant (GroundTruth)	User	Contact details: *Tel. +27 [0]33 342 6399, Fax. +27 086 6886297 Cel l +27 [0]823777089* Email: mark@groundtruth.co.za
Durban	Haffejee, Miriam Transnet	User	Contact details: Email: miriamh@npa.co.za
Durban	Harrison, Trevor CSIR	Researcher	Contact details: *Tel. +27 [0]31 2618161, Fax. +27 [0]31 2612509.* Email: tharrison@CSIR.co.za
Pietermaritzburg	Hay, Duncan	Researcher	Contact details: *Tel..* Email: hay@ukzn.ac.za
Empangeni	Jerling, Hendrik (Dr.)	Researcher	Contact details: *Tel. +27 [0]35-7933911 ext. 2319, Fax. +27 [0]35-7933162.* Email: hjerling@pan.uzulu.ac.za
	Jones, Di		Contact details: *Tel. +27 [0]32-525 8160* Email: dijones@iafrica.com
Empangeni	Kelbe, Bruce (Prof.)	Researcher	Contact details: Email: bkelbe@pan.uzul.ac.za
Durban	Kerr, Caroline Durban Metro (legal research)		Contact details: *Tel. +27 [0]31-3074920 , Fax. +27 [0]31-3074933.* Email: kerr@urbstrat.org.za

Region	Name	Category	Contact
			KerrC@durban.gov.za
Pietermaritzburg	Kotze, Donovan (Dr.)	Researcher	Contact details: *Tel..* Email: kotzed@ukzn.ac.za
	Lindley, David	User	Contact details: *Tel..* Email: lindley@wetlands.org.za
Durban	MacKay, Fiona	Researcher	Contact details: *Tel: +27 (0)31-328 8172* Email: fmackay@ori.org.za
Durban	Mander, Myles Consultant	Researcher/user	Contact details: *Tel. +27, Fax. +27* Email:myles@eco-futures.co.za>
Pietermaritzburg	Mander, Jennifer Consultant	User	Contact details: *Tel. +27(0)331 460796 Fax: +27(0)331 460895* Email: mander@ukzn.ac.za
Durban	Mann, Bruce ORI	Researcher	Contact details: *Tel.* Email: bmann@ori.org.za
	Marais, Elitza	User	Contact details: *Tel. 035 7992578.* Email: plan@uthungulu.co.za
Durban	Mather, Andrew Durban Metro	User	Contact details: *Tel. 031 3117281.* Email: mathera@durban.gov.za
	Matsheke, Alfred	User	Contact details: *Tel.033 3559434* *Fax: 033 3550614.* Email: Alfred.matsheke@kzndae.gov.za
Richards Bay	Mcinga, Nokuthula Transnet	User	Contact details: Email: nokthulam@npa.co.za
	McKelvey, Bianca	User	Contact details: *Tel.: 033 845 1464* *Fax: 033 845 1499.* Email: mckelveb@kznwildlife.com
Durban	McKenzie, Margaret	User	Contact details: *Tel..* Email: margaret@eject.co.za
	Mclean, Cameron	User	Contact details: *Tel. 031 311 7953.* Email: mcleanc@durban.gov.za
	Mulqueeny, Craig	User	Contact details: *Tel. 082 3382040* *Fax: 035 2051547.* Email: craigm@kznwildlife.com
Empangeni	Mzimela, Hendrick	Researcher	Contact details: *Tel +27 [0]35-7933911 Fax +27 [0]35-7933162.* Email: mmzimela@pan.uzulu.ac.za
	Naidoo, G N	Researcher	naidoogn@ukzn.ac.za
Empangeni	Owen, Rodney (Dr.)	Researcher	Contact Details: *Tel +27 [0]35-9026737 Fax + [0]35-9026750* Email: rowen@pan.uzulu.ac.za

Region	Name	Category	Contact
	Parak, Omar	User	Contact details: *Tel. 033 355 9438* *Fax: 033 3559614* Email: omar.parak@kzndae.gov.za Omar.Parak@dae.kztl.gov.za
Durban	Perissinotto, Renzo (Prof.)	Researcher	Contact details: *Tel. +27 [0] 31 2601194, Fax. +27 [0] 31 2602029* Email: renzo@biology.und.ac.za or perissinottor@ukzn.ac.za
Durban	Pillay, Shamila CSIR	Researcher	Contact Details: *Tel. +27 [0]31 2618161 Fax. +27 [0]31 2612509* Email: spillay@csir.co.za
Durban	Pradervand, Pierre ORI	Researcher	Contact details: *Tel. +27 [0]31 764 5356, Fax. +27 ? Cell 082 8021677* Email: seaworld@dbn.lia.net
Durban **A**	Pretorius, Ben Tourism	User	Contact details: *Tel.* *Cell* Email: info@ufudu.co.za
Empangeni/Richards Bay	Riddin, Taryn (Consultant?)	User	Contact details: *Tel. +27 [0]35-3402144.* Email: triddin@isat.co.za
Durban	Debra Roberts Local government	User	Contact details: *Tel..* Email: robertsd@durban.gov.za
Durban	Robbertson, Wendy ORI	Researcher	Contact details: *Tel. +27 [0]31 3373536, Fax. +27 [0]31 3372132.* Email: seaworld@dbn.lia.net
Durban	Scharler	Researcher	scharler@ukzn.ac.za
Pietermaritzburg	Still, Dave NGO (DUCT)	User	Contact details: *Tel. +27 [0]33 3423012, Fax. +27 [0]33 3420636.* Email: dave@pid.co.za
Howick	Taylor, Jim Conservation education	User	Contact details: *Tel..* Email: jt@wessa.co.za
St Lucia	Taylor, Ricky Conservation	User	Contact details: *Tel. +27 [0]35 5901436.* Email: taylorr@kznwildlife.com
Pietermaritzburg	Terry, Steve Industry	User	Contact details: *Tel..* Email: steve.terry@umgeni.co.za
Empangeni	Viljoen, Alfonso	Researcher	Contact details: *Tel: +27 (0)35-7933911 ext. 2316, Fax: +27 (0)35-7933162* E-mail: aviljoen@pan.uzulu.ac.za

Region	Name	Category	Contact
Empangeni	Vivier, Leon	Researcher	Contact details: *Tel: +27 (0)35-7933911 ext. 2316, Fax: +27 (0)35-7933162* E-mail: aviljoen@pan.uzulu.ac.za
Durban	Weerts, Kevin Industry HMG Transnet	User	Contact details: Email: kevin.weerts@hatch.co.za
Durban	Weerts, Steven CSIR	Researcher	Contact details: *Tel: +27 (0)31 2422356, Fax: +27 (0)31 2612509* Email: SWeerts@csir.co.za
Howick	Wildlife and Environment Society	User	Email: conservation@wessakzn.org.za
Eastern Cape			
Port Elizabeth	Adams, Janine (Prof.)	Researcher	Janine.Adams@nmmu.ac.za Contact details: *Tel. +27 [0]41 5042429, Fax. +27 [0]41 5832317.*
Port Elizabeth	Baird, Dan (Prof.)	Researcher	Email: dan.baird@nmmu.ac.za
Alice	Bally, Roderick (Prof.)	Researcher	Email: bally@ufhcc.ufh.ac.za ; bally@border.co.za rbally@ufh.ac.za Contact details: *Tel: +27 [0]40 6022543 Fax: +27 [0]40 6532314 Cell: +27 [0]82 2003422*
Port Elizabeth	Bok, Anton (Dr.) Consultant	User	Contact details: *Tel and Fax. (041) 373 3464; cell 083 4491801* Email: antbok@mweb.co.za *or* antonbok@iafrica.com Antonbok@aqua.co.za
	Bornman		tgbornman@nmmu.ac.za t.bornman@saiab.ac.za
	Brett, Greg Museum	User	Contact details: *Tel..* Email: kcelmuseum@softhome.net
East London	Buffalo City Environmental Management Fergus, Shirley; Foster, Raymond; Fraser, Rod; Reynhardt, Debbie	User	Contact details: *Tel: SF: 083 6510698; RF 043 7059389; DR 072 310 8710* Email: shirley@buffalocity.co.za; Rod@buffalocity.co.za; debbie@buffalocity.co.za Raymond@buffalocity.co.za
East London	Coastal conservation Schutte, Reo; Kretzman, Leigh-Ann;	Users	Contact details: *Tel: RS: 083 2325055; LK 083 651 0635; RH 082 327 4085* Email: siani@elaquarium.co.za

Region	Name	Category	Contact
	Henning, Roche		
Grahamstown	Cowley, Paul (Prof.)	Researcher	Contact details: *Tel. +27 [0]46 6035805, Fax. +27 [0]46 6222403, cell 082 470 9807* Email: p.cowley@saiab.ac.za P.Cowley@saiab.ac.za
	Du Preez, Derek	Researcher	Derek.dupreez@nmmu.ac.za
Grahamstown	Froneman, Pierre (Dr.)	Researcher	Contact details: *Tel + 27 [0] 46 6038524. Fax: + 27 [0] 46 6224377* Email: W.Froneman@ru.ac.za
Port Elizabeth	Gama, Phumelele	Researcher	Contact details: *Tel.: +27 [0]41 504-2779, Fax: +27 [0]41 583-2317, Cell: 082-925-2131* Email: Phumelele.Gama@nmmu.ac.za
	Goldswain, Martin Developer	User	Contact details: *Tel..* Email: qlakeinn@imaginet.co.za
Port Elizabeth	Hoskings, Stephen (Prof)	Researcher	Stephen.hosking@nmmu.ac.za
Port Elizabeth	Illenberger, Werner (Dr.) Consultant	User	Contact Details: *Tel. +27 (0)41 368 2771, or +27 (0)83 6261917* *Fax +27 (0)83 118 626 1917* Email: werner@webvision.co.za
Kenton on Sea	Laubscher, Dennis	User	Contact details: *Tel. 035 7992578.* Email: dennishl@intekom.co.za
Port Elizabeth	Lombard, Mandy	Researcher	Contact details: *Tel..* Email: gemsbok@mweb.co.za
King Williamstown	Lucas, Andrew DWAF	User	Contact details: *Tel. + Fax. +27* Email: LucasA@dwaf.gov.za
	Mpuhlu, Gladwell	User	Contact details: *Tel. +27 [0]47 531 1191, Fax. +27 [0]47 531 2882, Cell o83 859 0003* Email: gladwell.mpuhlu@deaet.gov.za
Port St Johns	Mtambeki, Enoch Community	User	*Cell +27[0]731941165*
Port St Johns	Mtlana, Momfundiso DEAT	User	Contact details: *Tel. +27 [0]47 531 0411, Fax. +27 [0]47531 2887.* Email: onesimo.matetela@deat.gov.za
	Murrel, Godfrey	User	Contact details: *Tel..* Email: gmurrel@mandelametro.gov.za
Grahamstown	Patterson, Angus	Researcher/User	Contact details: *Tel. +27 [0]46 6361002, Fax. +27 [0]46 622 2403.* Email: angus@saeon.ac.za
	Plumstead, Emile	Researcher	Contact details: *Tel..*

Region	Name	Category	Contact
			Email: plumstead@getafix.utr.ac.za
Port St Johns	Mrs Quist, Lope Local Government/ Municipality	User	Contact details: *Tel.: +27 [0]47 564-1207/8, Fax:? Cell: (0)47 531 2887* Email: elquist.pstjohnsmunicipality.com lopequist@hotmail.com
Port Elizabeth	Reddering, Koos Council for GeoScience	Researcher	Contact details: *Tel. +27 [0]41 581 1164, Fax. +27 [0]41 581 1165* Email: jsvr@ecgeomaps.org.za
	Nel, Ronel (Dr)	Researcher	Ronel.nel@nmmu.ac.za
	Rudman, Wayne		Contact details: *Tel..* Email: wlrudman@mweb.co.za
	Rump, Jenny	User	Contact details: *Tel. 082 8530700.* Email: zwartkops.trust@iafrica.com
Port St. Johns	Sithuko, Wiseman Community	User	*Cell +27[0]768569691*
Port Elizabeth	Snow, Gavin (Dr.)	Researcher	Contact details: *Cell No. 084-603-5548 (no office number available)* Email: gavin.snow@nmmu.ac.za
Port Elizabeth	Strydom, Nadine (Dr.)	Researcher	Contact details: *Tel. +27 [0]46 6361002, Fax. +27 [0]46 6222403,* Email: Nadine.Strydom@nmmu.ac.za
East London	Uys, Mandy	User	Contact details: *Tel..* Email: laughingh20@icon..co.za
	Venter, Jan Conservation Eastern Cape Parks	User	Contact details: *Tel. +27 [0]43 742742557, Fax. ?, Cell [0]82 4161096* Email: jan.venter.@ecparks.co.za
Port St Johns	Walker, Graeme Umngazi River Bungalows	User	Contact details: *Tel: +27 (0)47- 5641115 Fax: ?* Email: gm@umngazi.co.za
Grahamstown	Whitfield, Alan (Dr.)	Researcher	Contact details: *Tel. +27 [0]46 6361002, Fax. +27 [0]46 6222403,* Email: A.Whitfield@ru.ac.za Alan Whitfield A.Whitfield@saiab.ac.za
	Wood, Aidan	Researcher	Contact details: *Tel..* Email: tagfish@telkomsa.net
Port Elizabeth	Wooldridge, Tris (Prof.)	Researcher	Contact details: *Tel. +27 41 5042425, Fax. +27 41 5042317* Email: Tris.Wooldridge@nmmu.ac.za
Western Cape			
Knysna	Allanson, Brian (Prof.)	Researcher/user	Email: ba11@pixie.co.za

Region	Name	Category	Contact
			Contact details: *Tel 044 382 6107 Fax 044 384 0658 cell 082 5519738*
Cape Town	Attwood, Colin (Dr)	Researcher	Contact details: *Tel..* Email: colin.attwood@uct.ac.za
Stellenbosch	Barwell, Laurie (Dr.)	Researcher	Email: lbarwell@csir.co.za
Cape Town	Boyd, Alan (Dr.) Marine and Coastal Management DEAT	User	Contact details: *Tel. +27 , Fax. +27 [0]* Email: ajboyd@deat.gov.za
Cape Town	Clark, Barry	Researcher	Barry.clark@uct.ac.za
	Colvin, Christine	Researcher	Contact details: *Tel..* Email: c.colvin@csir.co.za
Cape Town	Compton, John (Prof)	Researcher	Contact details: *Tel..* Email: john.compton@uct.ac.za
Cape Town	Day, Jenny (Prof)	Researcher	Contact details: *Tel..* Email: jenny.day@uct.ac.za
	De Villiers, Pierre Conservation, estuaries Cape Nature	User/researcher	Contact details: *Tel: 021 866-8023 Fax: 021 866-1523 Cell: 083 236 2924* Email: estuaries@capenature.co.za
	Fielding, Peter		Contact details: *Tel. 083 7771958.* Email:
	Hockey, Phil (Dr)	Researcher	Contact details: *Tel..* Email: phil.hockey@uct.ac.za
Stellenbosch	Huizinga, Pieter CSIR/Consultant	Researcher	Contact details: *Tel. +27 [0]21 8882495, Fax. +27 [0]21 8882693* Email: phuizing@csir.co.za p.hiuzinga@adept.co.za
	Jayiya, Terence Consultant	User	Contact details: *Tel..* Email: tjayiya@jmat.co.za
Cape Town	Lamberth, Steve Marine Coastal Management	User	Contact details: *Tel..* Email: lamberth@deat.gov.za
Cape Town	Largier, John	Researcher	Contact Details: *Tel. +27 (21) 650-3625 Fax +27 (21) 650-3979* Email: largier@physci.uct.ac.za jlargier@ucdavis.edu
Cape Town	Malan, Niel Marine Coastal Management DEAT	User	Contact details: *Cell: 082 5749807* Email: dmalan@deat.gov.za

Region	Name	Category	Contact
Cape Town	Matoti, Ayanda Marine Coastal MangmentDEAT	User	Contact details: Email: amatoti@deat.gov.za
Stellenbosch	Monteiro, Pedro (Dr)	Researcher	Contact details: *Tel..* Email: pmonteiro@csir.co.za
Stellenbosch	Morant, Pat (Dr)	Researcher	Contact details: *Tel..* Email: p.morant@csir.co.za
	Nel, Pierre	User	Contact details: *Tel..* Email: pierren@sanparks.org
	Omar, Razeema	User	Contact details: *Tel..* Email: romar@deat.gov.za
Saldanha Bay	Pieters, Andre Transnet	User	Contact details: *Tel..* Email: andre.pieters@hmgjv.co.za
	Riley, Andre	User	Contact details: *Tel..* Email: andrer@sanparks.co.za
Cape Town	Robinson, Tammy (Dr)	Researcher	Contact details: *Tel..* Email: tamara.robinson@uct.ac.za
Cape Town	Roets, Wietsche Western Cape Government	User	Contact details: *Tel. +27 [0]21 8891560, Fax. +27 [0]21 8891523.* Email: roetsw@cncjnk.wcape.gov.za
	Sweijd, Neville (Dr)		Contact details: *Tel..* Email: nsweijd@deat.gov.za nsweijd@csir.co.za
Stellenbosch	Taljaard, Susan CSIR	Researcher	Contact details: *Tel. +27 [0]21 8882494, Fax. +27 [0]21 8882693.* Email: staljaar@csir.co.za
Cape Town	Turpie, Jane (Dr.) Consultant and Academic	Researcher/user	Contact details: *Tel. +27 [0]21 6503302, Fax. +27 [0]21 6503295.* Email: jturpie@uct.ac.za jane@anchorenvironmental.co.za
Cape Town	Thwala, Nomphulelo Conservation, estuaries Cape Nature	User	Contact details: *Tel: 021 866-8023 Fax: 021 866-1523 Cell: 083 8470122* Email: estuaries@capenature.co.za
	Van Ballegooyen, Roy	Researcher	Contact details: *Tel..* Email: rvballeg@csir.co.za
Cape Town	Van Driel, Dirk DWAF	User	Contact details: *Tel. +27 [0]12 808 0374, Fax. +27 [0]12 808 0338.* Email: eeu@dwaf-hri.pwv.gov.za
Saldanha	Van Niekerk, Christo	User	Contact details: *Tel..* Email: metsal@imaginet.co.za

Region	Name	Category	Contact
Stellenbosch	Van Niekerk, Lara CSIR	Researcher	Contact details: *Tel. +27 [0]21 888 2491, Fax. +27 [0]21 888 2693.* Email: lvnieker@csir.co.za
	Zungu, Mdu	User	Contact details: *Tel..* Email: Vincent.zungu@uct.ac.za
Gauteng			
	Max Clark (Dr) Consultant	User	Contact details: *Tel..* Email: max.clark@hatch.co.za
	Claassen, Marius Dr		Mclaasse@csir.co.za
	Paul Furniss Consultant	User	Contact details: *Tel..* Email: paul.furniss@hatch.co.za
	Jack, Landile	User	Contact details: *Tel..* Email: jackl@dwa.gov.za
Pretoria	Mitchell, Steve (Dr.) Ex WRC	Funder	Contact details: *Cell. 0827951465* Email: steve.mitchell@bufo.co.za
Pretoria	National Research Foundation Dr A Kaniki and Dr R Le Roux	Funder	Contact details: *Tel..* Email: Andrew@nrf.ac.za; Renee@nrf.ac.za
Johannesburg	Wepener, Victor (Dr)	Researcher	Contact details: *Tel..* Email: vw@na.rau.ac.za
Pretoria	Weston, Barbara DWAF	User	Contact details: *Tel. +, Fax. +* Email: westonb@dwaf.gov.za
Outside of RSA			
Australia	Hearne, John (Prof.)	Researcher	Contact details: *Tel. +61 [03] 9925 3219 Fax: +61 [03] 9925 1748* Email: john.hearne@rmit.edu.au
Netherlands	Slinger, Jill (Dr.) Consultant	Researcher/user	Contact details: *Tel. +31 [0]15 2191538, Fax. +31 [0]15 2124892*. Email: jill.slinger@resource.nl j.h.slinger@tbm.tudelft.nl <j.h.slinger@tbm.tudelft.nl>
Sri Lanka	Smakhtin, Vladimir IWMI	Researcher	Contact details: *Tel. +94 1 787404, Fax: +94 1 786854* Email: v.smakhtin@cgiar.org
United Kingdom	Quinn, Nevil	Researcher	Nevil.quinn@uwe.ac.uk

7.5 WRC Estuary Publications Accessed from the Website

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Watling, R.J. and Watling, H.R. 1982. Metal surveys in South African estuaries. IV. Keurbooms and Bietou Rivers (Plettenberg lagoon). Water SA 8 (2) 114-120.

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Perissinotto, R., Stretch, D. and Forbes, A.T. et al., 2004. Contributions to information requirements for the implementation of resource directed measures for estuaries: Vol. 2: Response of the biological communities to flow variation and mouth state in two KwaZulu-Natal temporarily open/closed estuaries. Water Research Commission Research Report No. 1247/2/04. Water Research Commission, Pretoria.

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7.6 Questionnaire and Survey Results: Raw Data Set

General Question 1

Which of the categories most describes your role? (you may consider yourself to be more than one)		
Answer Options	**Response Percent**	**Response Count**
Research Provider	47.8%	33
Research User	47.8%	33
Research Funder	4.4%	3
answered question		**69**

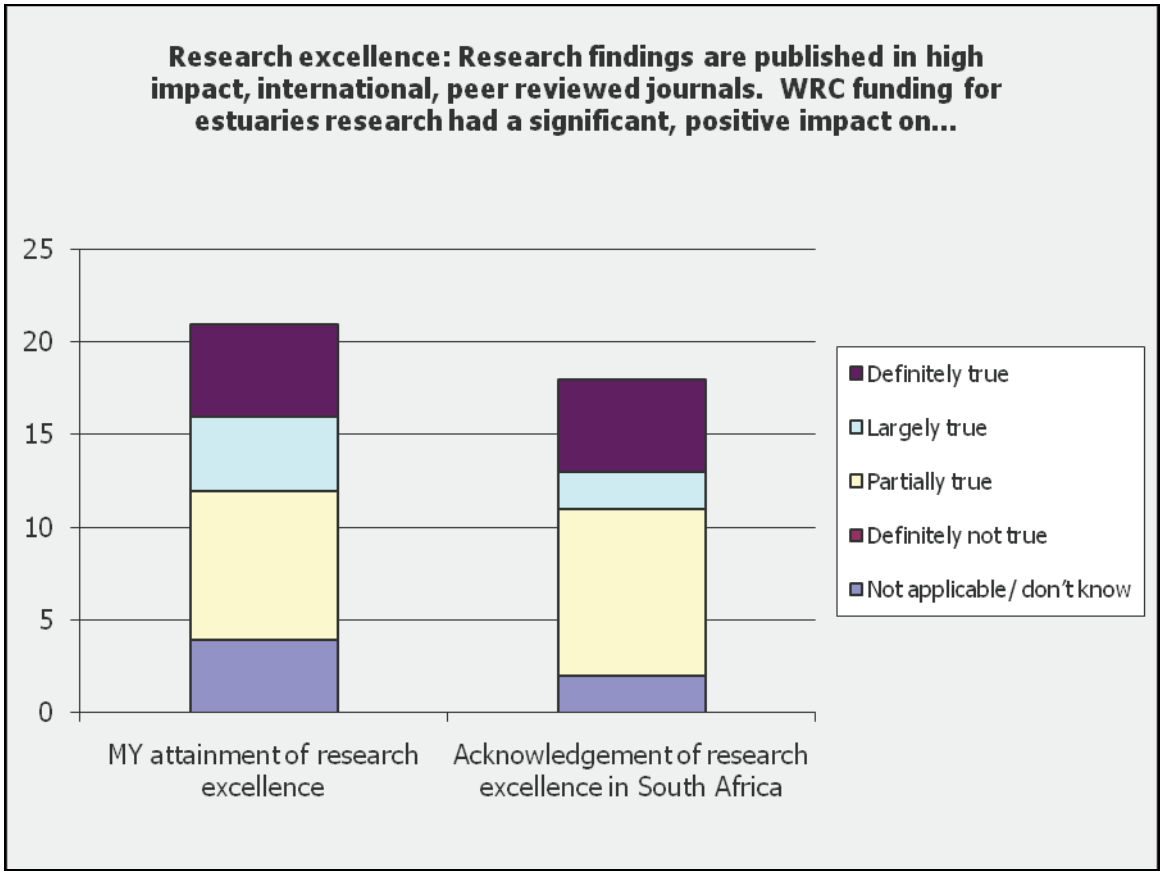
General Question 2

Name	**Institution/Organisation**
G C Bate	Botany NMMU
Steve Mitchell	ex WRC
Lara van Niekerk	CSIR
Nicolette Forbes	Marine and Estuarine Research
A.T.Forbes	Marine & Estuarine Research/Honorary Professor UKZN
Wayne Leslie Rudman	PRO The Rod Club
Dr Nadine A. Strydom	Nelson Mandela Metropolitan University
Cameron McLean	eThekwini Municipality
William Froneman	Rhodes university
Susan Taljaard	CSIR
Andrew Mather	eThekwini municipality
Michael Silberbauer	Resource Quality Services, DWA
Gavin Snow	Botany Department, NMMU
Nompumelelo Thwala	Nelson Mandela Metropolitan University/CapeNature
Jenny Whitehead	iRAP (Consultant)
Tom Hecht	Envirofish-Africa (Pty) Ltd
Josias	NZG
Mbulelo Dopolo	South African National Parks
Paul Cowley	SAIAB
Di Dold	Wildlife and Environment Society of S.A. and Coastwatch Project

Stefan Schmidt	Professor
Rebecca Bowd	CEAD
Nkosinathi Michael Manqele	Academic - DUT
Renzo Perissinotto	University of KwaZulu-Natal
Donovan Kotze	University of KWaZulu-Natal
Taryn Riddin	Botany Department, NMMU
Victor Wepener	Centre for Aquatic Research, University of Johannesburg
Duncan Hay	University of KwaZulu-Natal
Pierre de Villiers	CAPE Estuaries Programme
Ursula Scharler	University of KwaZulu-Natal
Michelle Boshoff	Private Sector - Mining
Stephen Hosking	NMMU
Margaret McKenzie	Consultant
Boyd Escott	Ezemvelo KZN Wildlife
Tandi Breetzke	SSi Engineers and Environmental Consultants
Mander	eco-futures
Andrew Booth	DUCT
Alan Whitfield	SA Institute for Aquatic Biodiversity (SAIAB)
Landile Jack	Department of Water Affairs
Lynn Jackson	Coastal & Environmental Consulting
Bruce Mann	Oceanographic Research Institute
Janine Adams	NMMU
Piet Huizinga	Pensioner, previously CSIR
Aidan Wood	Consultant
Prof D.P.Cyrus	CRUZ, Department of Zoology, University of Zululand
Ricky Taylor	Ezemvelo KZN Wildlife
Jenny Rump	Zwartkops Trust
Piet Huizinga	pensioner, previously CSIR
Santosh Bachoo	Ezemvelo KwaZulu-Natal Wildlife
martin de wit	de wit sustainable options
Ayanda Matoti	DEPARTMET OF ENVIRONMENTAL AFFAIRS
Iain Bickerton	Iain Bickerton Consulting Estuarine Ecologist

Research Providers

Research Provider: Question 1						
Research excellence: Research findings are published in high impact, international, peer reviewed journals. WRC funding for estuaries research had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY attainment of research excellence	5	4	8	0	4	21
Acknowledgement of research excellence in South Africa	5	2	9	0	2	18



Research Provider: Question 2						
Discourse: Researchers are actively contributing to the development of the global body of scientific knowledge as measured by citation indices. WRC funding for estuaries research had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
the citation indexes of MY publications	2	4	4	2	8	20
the GLOBAL BODY of scientific knowledge	2	4	8	1	3	18
List 3 of your most cited papers (author, year, journal)						12

Respondents most cited papers

Respondent	Cited Papers
1	Strydom, Whitfield and Patterson, 2002, The Influence of altered freshwater flow regimes on abundance of larval and juvenile Gilchristella aestuaria (Pices: Clupeidae) in the upper reaches of two South African estuaries. Marine and Freshwater Research 53: 431-438 Strydom, Whitfield and Wooldridge, 2003, The role of estuarine type in characterising early stage fish assemblages in warm temperate estuaries, South Africa. African Zoology 38: 29-43 Strydom, 2003, Occurrence of larva and early juvenile fishes in the surf zone adjacent to two intermittently estuaries, South Africa. Environmental Biology of Fishes 66: 349-359
2	Bowd R, Kotze DC, Morris CD & Quinn NW (2006) Towards the development of a macroinvertebrate sampling technique for palustrine wetlands in South Africa: a pilot investigation in the KwaZulu-Natal Midlands. African Journal of Aquatic Science. 31(1): 15-23 Bowd R, Kotze DC, Morris CD & Quinn NW (2006) Testing the applicability of the SASS5 scoring procedure for assessing wetland health: a case study in the KwaZulu-Natal Midlands, South Africa. African Journal of Aquatic Science. 31(2): 229-246
3	Whitfield, AK, Adams, JB, Bate, GC, Bezuidenhout, K, Bornman, TG, Cowley, PD, Froneman, PW, Gama PT, James, NC, Mackenzie, B, Riddin, T, Snow, GC, Strydom, NA, Taljaard, S, Terörde, AI, Theron, AK , Turpie, JK, van Niekerk, L, Vorwerk, PD and Wooldridge, TH. (2008). African Journal of Marine Science 2008, 30(3): 453–473. Turpie, JK, Adams, JB, Joubert, A, Harrison, TD, Colloty, BM, Maree, RC, Whitfield, AK, Wooldridge, TH, Lamberth, SJ, Taljaard, S, and van Niekerk, L (2002). Assessment of the conservation priority status of South African estuaries for use in management and water allocation. Water SA. 28, 2: 191–206.

	Taljaard S; Snow G; Gama P; Van Niekerk L (2009). Verification of a conceptual model of water quality for small temporarily open/closed estuaries: East Kleinemonde Estuary, South Africa. Marine and freshwater research. Vol. 60, No 3, pp. 234-245.
4	1) Thomas CM, Perissinotto R and Kibirige I (2005). Estuarine, Coastal and Shelf Science 2) Kibirige I, Perissinotto and Thwala X (2006). Marine Biology 3) Perissinotto R, Iyer K and Nozais C (2006). Botanica Marina
5	Riddin and Adams, 2009, Aquatic Botany Riddin and Adams, 2008, Estuarine and Coastal Shelf Science Whitfield et al., 2008, African Journal of Marine Science
6	Attwood et al., 1997 S.Afr. J. Mar. Sci. 18 Brouwer et al., 1997 S.Afr. J. Mar. Sci. 18 Mann et al., 2006 Afr. J. Mar. Sci. 28
7	1. Adams, J.B. Bate, G.C. and M. O'Callaghan. 1999. Estuarine Primary Producers. In: (B.R. Allanson and D. Baird). Estuaries of South Africa. Cambridge University Press. pp 91-118. 2. GC Bate, AK Whitfield, JB Adams, P Huizinga and TH Wooldridge. 2002. The importance of the river estuary interface (REI) zone in estuaries. Water SA 28: 271-279. 3. Adams, JB, Bate, GC, Harrison, TD, Huizinga, P, Taljaard, S, van Niekerk, L, Plumstead, E, Whitfield, AK and Wooldridge, TH. 2002. A method to assess the freshwater inflow requirements of estuaries and application to the Mtata Estuary, South Africa. Estuaries 25(6B): 1382-1393.
8	Cyrus, D.P. & Blaber, S.J.M. 1987. The influence of turbidity on juvenile marine fish in estuaries. Part 2: Laboratory studies, comparisons and conclusions. J. Exp. Mar. Biol. Ecol., 109: 71-91 (128 Citations). Cyrus, D.P. & Blaber, S.J.M. 1992. Turbidity and salinity in a tropical northern Australian Estuary and their influence on fish distribution. Est. Coast. Shelf Sci., 35: 545-563 (69 Citations). Blaber, S.J.M., Cyrus, D.P., Albaret, J-J, Chong Ving Ching, Day, J.W., Elliott, M., Fonseca, M.S., Hoss, D.E., Orensanz, J., Potter, I.C. & Silvert, W. 2000. Effects of fishing on the structure and functioning of estuarine and nearshore ecosystems. ICES J. Mar. Sci., 57: 590-602 (63 Citations).
9	De Wit, M.P., Crookes, D.J. & van Wilgen, B.W. 2001. Conflicts of interest in environmental management: Estimating the costs and benefits of a tree invasion. Biological Invasions, 3:167-78. ENV-P-R 2001-027. McConnachie, A.J., de Wit, M.P., Hill, M.P., & Byrne, M.J. 2003. Economic evaluation of the successful biological control of Azolla filiculoides in South Africa. Biological Control, 28: 25-32. Van Wilgen, B.W., de Wit, M.P., Anderson, H.J., Le Maitre, D.C., Kotze, I.M., Ndala, S., Brown, B. & Rapholo, M.B. 2004. Costs and benefits of biological control of invasive alien plants: case studies from South Africa. South African Journal of Science, 100(1/2), January/February: 113-22.

Research Provider: Question 3						
Discourse: Staff from end user organizations and community members dedicate time to make meaningful contributions to the strategic direction of WRC funded estuaries research.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the strategic direction of research in SOUTH AFRICA	6	6	7	0	1	20
List up to three strategic directions that have been influenced						17

Comments from this question contained in the table below

Respondent	Comment on strategic directions
1	Data for RDM of estuaries All botanical studies in estuaries Estuary hydrodynamics
2	understanding and determining environmental flows water quality measurement and interpretation
3	One would have to know a lot about WRC funded research which I do not think would necessarily apply to the average estuarine researcher - otherwise it becomes a guess. I can't think of a particular direction.
4	Freshwater Reserve Determination for Estuaries Estuarine Management Plans
5	Rural community involvement Rural community education Rural community skills building
6	Ecological Flow Requirement Methods for Estuaries Flow requirements of the Marine Environment National Estuary Management Protocol & Estuary Management Plans
7	Biodiversity audits Estuarine monitoring Catchment to coast approach

8	A greater focus on management of the overall system rather than management for one or a few individual taxa A greater focus on the ecosystem services delivered by the system A greater explicit focus on effects of human activities on the state of the system and the ecosystem services that it delivers
9	RDM methodologies and freshwater requirements of estuaries, incorporated into legislation as Estuarine Management Plans
10	Detailed understanding of the ecology of small estuaries Incorporation of economics into estuary management decision making The consideration of economic empowerment in estuary management
11	Reserve setting for conservation Valuation of services management of estuary habitat
12	Adoption of estuary management planning at some municipalities and by some communities Some research results have influenced estuary management planning decision in some municipalities
13	role of river water in estuaries
14	Assessing the importance of freshwater inputs to the functioning of estuaries. Identification of the role of the river estuary interface (REI) zone in the ecology of permanently open estuaries. The development of indices to translate the health and importance of plant habitats within estuaries into management tools.
15	Management protocols for estuaries. Understanding of the freshwater inflow requirements of estuaries. Encouraged applied research to address the National Water Act
16	Estuarine Management Estuarine Reserve Requirements Ecological Functioning of certain types of Estuaries
17	MCM influenced strategic direction on the economic valuation of estuarine goods and services

Research Provider: Question 4						
Discourse: Events have been programmed and funded to develop and sustain discourse to strengthen relationships between research providers, research users and the wider community to inform and contextualize the research.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has a program of events that sustain relevant discourse at NATIONAL SCALE among research providers, research users and the wider community	3	5	5	2	5	20
List recent events that have had national participation						11

Comments from this question listed below

Respondent	Recent events that have had national participation
1	East Kleinemond research programme KZN estuaries programme
2	Update of the RDM methodology - WRC funded project - national team KZN Estuarine Management Course (May 2009) - FETWATER course jointly funded by WRC (run by myself) which involved local, regional and national government agencies as well as NGO's and public
3	Presumably these would be WRC sponsored/organized events - would WISA conferences fall into this category? There is no regular program, etc., etc. that I know of. Surely WRC themselves could better answer this question.
4	Various Estuary Management plans
5	Ecological Flow Requirement Methods for Estuaries Estuary Management and Planning National Estuary Health Assessment (using the above approach) for National Biodiversity Assessment (SANBI)
6	Estuarine Monitoring Workshop (Port Elizabeth, March 2010) Estuarine Health Assessment Workshop (Stellenbosch, November 2009) Revision of RDM Procedures for Estuaries (Cape Town, August 2009)
7	While the Eastern Cape Estuaries Programme was not explicitly national, it did contribute to strengthening relationships that extended well beyond just the E Cape, i.e. into W Cape and KZN
8	The upcoming Mfolozi/Msunduzi Indaba at St Lucia (funded by WRC) involves the participation of researchers, environmental managers and farmers in a single forum to discuss a way forward in terms of solving the St Lucia crisis.

9	Activities have mainly been conducted through CERM with funding from WRC. National meetings with estuary scientists and managers from around the country were held at strategic times to address new research areas. Research programmes were identified and prioritised which led to multi-disciplinary, inter-institutional programmes across the country.
10	Not sure on who actually provided funding. 1. Estuarine Reserve Determination Methodology Revision Workshop 2. uMfolozi Estuary Workshop (directly linked to the St Lucia System as well) (taking place at end of April (definitely WRC funded)
11	Economic value of estuaries was a once-off study and remained a stand-alone CSIR report.

Research Provider: Question 5

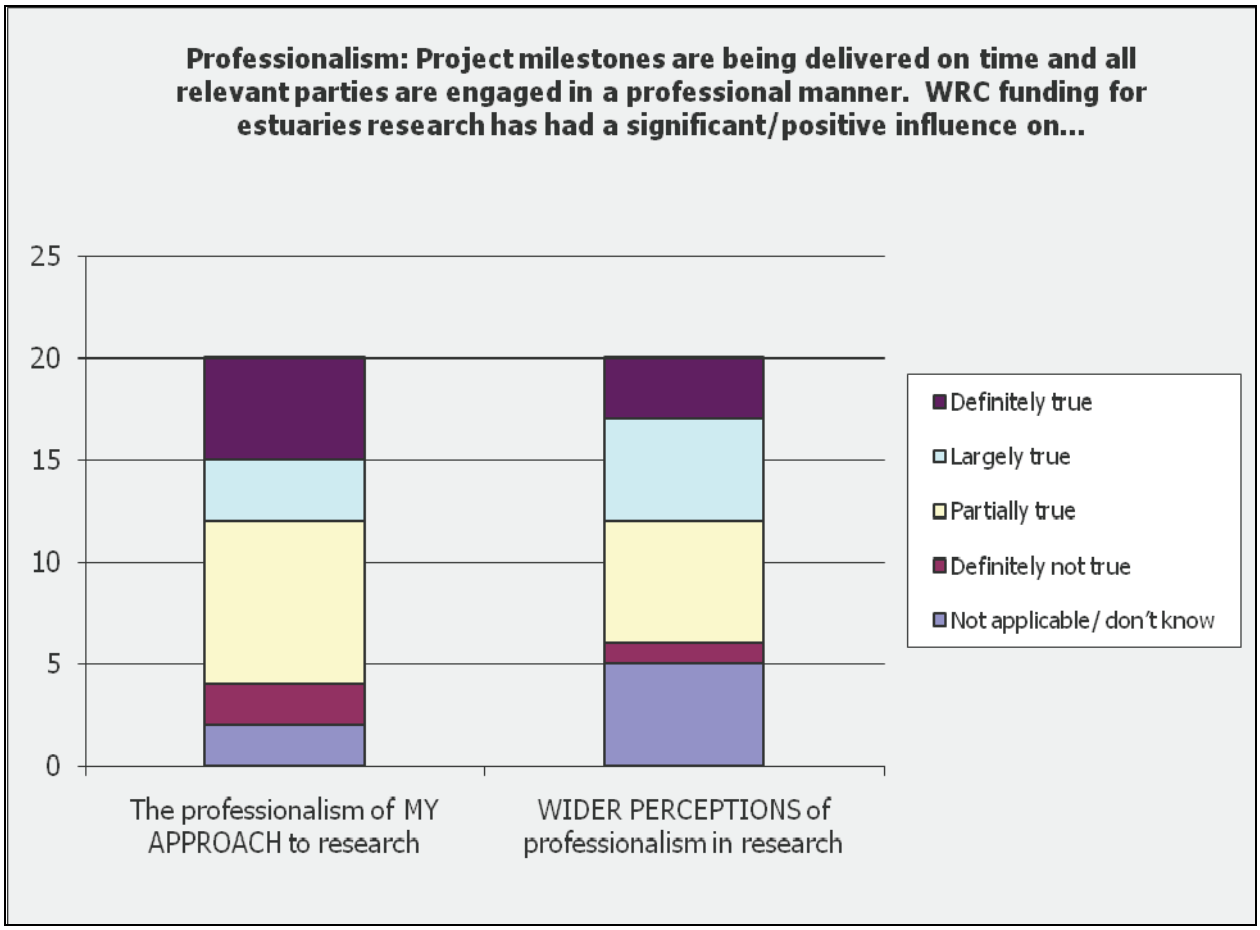
Professionalism: Project milestones are being delivered on time and all relevant parties are engaged in a professional manner. WRC funding for estuaries research has had a significant/positive influence on...

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
The professionalism of MY APPROACH to research	5	3	8	2	2	20
WIDER PERCEPTIONS of professionalism in research	3	5	6	1	5	20
General comments						8

Comments from this question listed below

Respondent	Comment/s
1	Why should WRC funding affect my professionalism or other peoples' perceptions? It sounds like WRC funding represents some sort of road to Damascus experience whereby all, including the error of my scientific ways, is suddenly revealed.
2	Large multi-institutional, multi-disciplinary projects are sometimes difficult to deliver on time, but research providers and users have been very committed to both quality, brief and schedule.
3	Too much emphasis has been put on the delivery of reports, as indicator of milestone achievements. This has at times impacted negatively on the output of more rigorous, peer-reviewed publications in the primary literature.

4	The linking of deliverables to payments at various stages of a research project has a positive spin-off in terms of delivery of products by scientists.
5	I honestly have not been involved in any programmes involving the WRC
6	The system ensures that projects are delivered on time and within budget. Input from the steering committee/reference group ensures the quality of research.
7	Have not received WRC funding for the past probably 10 years but did in the past.
8	Estuarine research was a relatively small part of my professional development



Research Provider: Question 6						
Knowledge sharing: Researchers are sharing their findings and insights with leading international peers, researchers from other disciplines and parties that represent other knowledge forms as measured by co-authorship in peer reviewed journals. WRC funding for estuaries research has enabled...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
ME to share knowledge	10	4	2	2	2	20
Researchers to share knowledge WITH RESEARCH PROVIDERS	7	7	3	0	3	20
Researchers to share knowledge WITH RESEARCH USERS	5	8	5	0	2	20
Researchers to share knowledge WITH RESEARCH FUNDERS	6	8	5	0	1	20
Please provide examples or comments						13

Comments from this question are presented below

Respondents	Examples and comments
1	Can only speak from my involvement in the temporarily open closed estuary study - very valuable in opening discussion about these systems which are the most numerous estuarine type along the coast and allowed the findings to be discussed at provincial and local level with Coastal Working Groups. Also provided important information to the local municipality.
2	We interact significantly with the eThekwini municipality and Ezimvelo KZN Wildlife but this is our experience. I don't know how the range of answers that is going to be given to the above questions can be interpreted unless they are all crowded on one or other side.
3	For the project I am involved with, our project team meets regularly to discuss the project. Often other professional work is discussed. As part of our project we have communicated with the perspective research users. These research users played a key role with our research. Steering committee meetings aid in the sharing of knowledge between the researcher and the funder.
4	I have always found the project steering committee meetings a place of learning and sharing. It has greatly influenced my present thinking and strengthened my network. The flow requirement studies are very good at generating high class international research publications. While, the Eastern Cape Estuaries Programme especially had knowledge sharing amongst knowledge providers and users as an explicit goal and this was also

	reflected in the products which often turned out very different from the original proposals. Unfortunately this also made some of the projects less publishable (e.g. development of an estuarine management training programme), i.e. more of an benefit to the users.
5	The 'juniorisation' in some sectors of the users and funders categories has recently caused a capacity problem, with perceived diminished returns.
6	Regular WRC progress meetings provide feedback with Research Funders
7	The TT documents I have authored or co-authored have found a wide audience amongst researchers, government, stakeholders and funders.
8	Herewith an example of knowledge sharing from project K5/1581: Whitfield, A.K., Adams, J.B., Bate, G.C., Bezuidenhout, K., Bornman, T.G., Cowley, P.D., Froneman, P.W., Gama, P.T., James, N.C., Mackenzie, B., Riddin, T., Snow, G.C., Strydom, N.A., Taljaard, S., Terörde, A.I., Theron, A.K., Turpie, J.K., van Niekerk, L., Vorwerk, P.D. & Wooldridge, T.H. 2008. A multidisciplinary study of a small, temporarily open/closed South African estuary, with particular emphasis on the influence of mouth state on the ecology of the system. African Journal of Marine Science 30(3), 453-473.
9	There are a number of multi-author papers that arose from WRC funding e.g. AK Whitfield, JB Adams, GC Bate, K Bezuidenhout, TG Bornman, PD Cowley, PW Froneman, PT Gama, NC James, B Mackenzie, T Riddin, GC Snow, NA Strydom, S Taljaard, AI Terörde, AK Theron, JK Turpie, L. van Niekerk, PD Vorwerk and TH Wooldridge. 2008. A multidisciplinary study of a small, temporarily open/closed South African estuary, with particular emphasis on the influence of mouth state on the ecology of the system. African Journal of Marine Science 30: 453-473. GC Bate, AK Whitfield, JB Adams, P Huizinga and TH Wooldridge. 2002. The importance of the river estuary interface (REI) zone in estuaries. Water SA 28: 271-279. Individuals have also had interaction with leading international peers.
10	Knowledge sharing of our estuarine valuation work was limited to the project participants and funder itself.

Research Provider: Question 7

Knowledge sharing: Knowledge sharing has been explicitly supported through the facilitation of opportunities for social sharing and a commitment to the publication of reports, fact sheets and other publications in easily accessible language – e.g. through the appointment of dedicated knowledge brokers.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
WRC estuaries research has had a significant, positive impact on COMMITMENT to knowledge sharing among research providers, research users, research funders and the wider community in SOUTH AFRICA	4	6	7	1	2	20
List fields in which knowledge sharing has been supported at national scale						12

Comments from this question are presented below

Respondents	Fields in which knowledge sharing has been supported
1	All fields of estuary function, physical and biological
2	While some popular articles and documents have been produced and distributed I do not think enough has been done to make research findings available to the wider community.
3	"Fields" is too vague - give some clues. WRC estuaries research has made a contribution to this research field but I don't see how it has increased commitment etc - but presumably that is the justification for the question.
4	WRC funded FW Invertebrate Guide not easy to access
5	National Estuary Management Protocol & Estuary Management Plans Ecological Flow Requirement Methods for Estuaries
6	Open RDM workshops and review/monitoring workshops.
7	Management of estuaries located in a variety of different social contexts
8	Through a number of printed publications of various WRC reports either as scientific reports or as accessible documents for the public and in more than one language.
9	Books and reviews on South African estuaries, e.g. the following book chapter arose from WRC funded work in temporarily open/closed estuaries in KwaZulu-Natal and the Eastern Cape, and has now been expanded into a book that will be published in 2010: Perissinotto, R., Stretch, D.D., Whitfield, A.K., Adams, J.B., Forbes, A.T. & Demetriades, N.T. 2009. Ecosystem functioning of temporarily open/closed estuaries in South Africa. In: Estuaries: Types, Movement Patterns and Climatical Impacts (ed. J.R. Crane & A.E. Solomon). Nova Science Publishers, New York, ISBN 978-1-60876-859-2.

10	Estuary management - particularly reports from the EC estuaries management programme.
11	As I have not had funds recently it is difficult to give proper comment on this questions.
12	Not in the subject field of estuarine valuation

Research Provider: Question 8

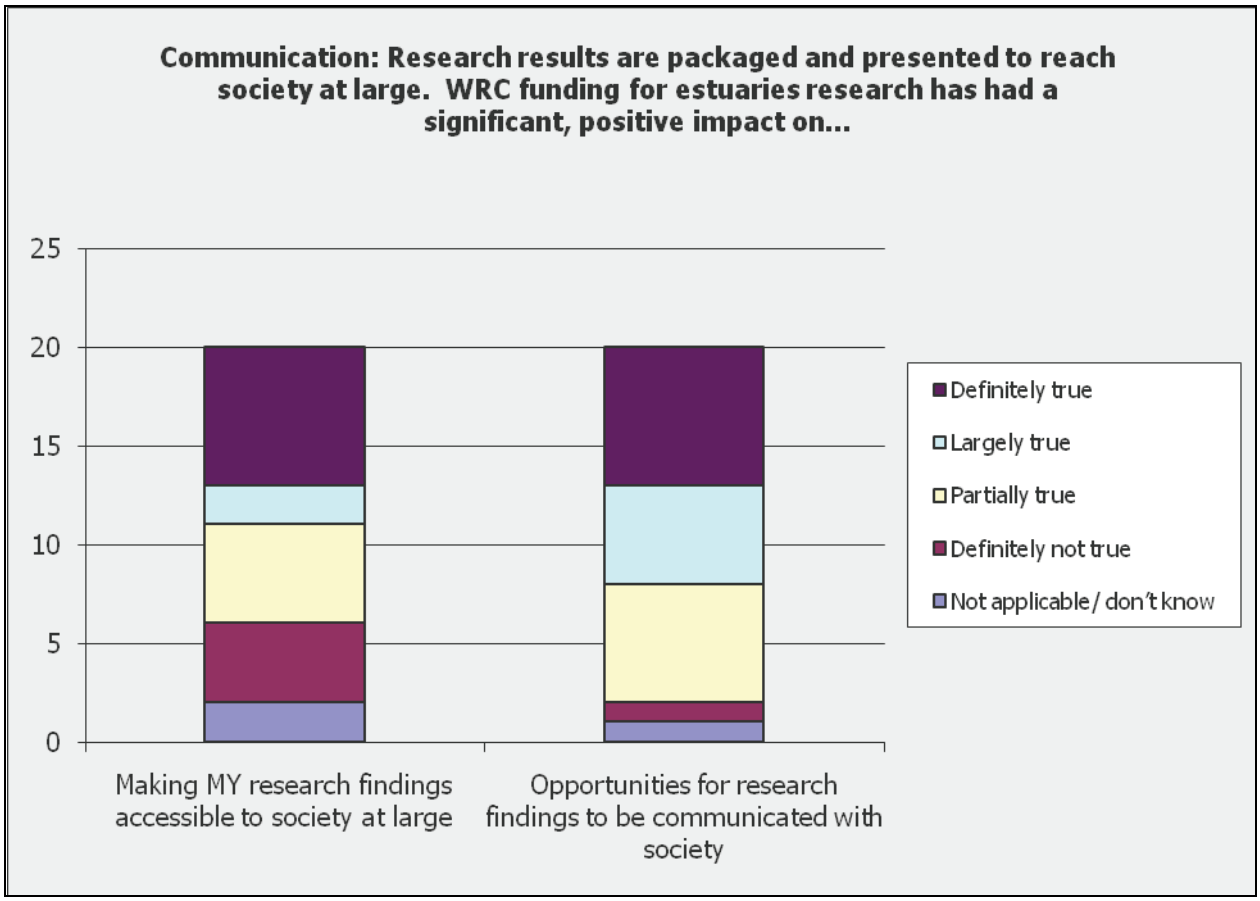
Communication: Research results are packaged and presented to reach society at large. WRC funding for estuaries research has had a significant, positive impact on...

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
Making MY research findings accessible to society at large	7	2	5	4	2	20
Opportunities for research findings to be communicated with society	7	5	6	1	1	20
Examples and comments						12

Comments and examples from this question are presented below

Respondents	Comments and examples
1	WRC glossy reports
2	There are some semi-popular outlets like Water Wheel but I have never seen a copy outside of the one that is posted to me and I would doubt that many people know of or have access to the online versions. Maybe as water shortages and water quality become greater issues there would be more interest.
3	The research will contribute to my PhD. I intend to publish papers based on the research.
4	I believe that we are still not getting the research packaging right. I felt that the Estuary Management brochures were to light weight and the Ecological Flow Requirement summaries to dry. I have recently seen some really good packaging done by Australia (e.g. Great Barrier Reef Outlook 2009) and think we are still some way of before we can pat ourselves on the back. This is an important aspect that needs further attention. The WRC might need to more explicitly incorporate information packaging into project proposals in future to train researchers in the correct behaviour.
5	WRC Reports and popular articles in outlets such as the Water Wheel.
6	Estuaries management handbook
7	I think there is a huge gap between researchers and managers. Data is often "lost" in reports as managers are not educated to understand research data. There is an even larger gap between researchers and the layman regarding what research is being done, why and what the results are showing. Not

	enough "glossies" that reach the general public via municipalities or rate payers associations.
8	The WRC TT documents are an excellent way of making research findings accessible to society
9	We are about to publish, with the financial support of the WRC, a full-colour booklet (56 pages)entitled "A guide to the ecology of temporarily open/closed estuaries" for distribution to schools, coastal managers and the general public.
10	More can probably be done about this.



Research Provider: Question 9						
Relevance: New knowledge is developed with the explicit recognition of its intended application, e.g. to inform management decisions and policy development. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
Opportunities FOR ME to engage relevant (applied) research	10	5	2	1	2	20
the relevance of research for SOUTH AFRICA	8	8	1	1	1	19
the relevance of research OUTSIDE OF SOUTH AFRICA	4	3	5	0	7	19
List the key issues						10

Key issues are presented below

Respondents	Key issues
1	Understanding autotrophic microalgal functioning in RSA estuaries. Diatom flora largely named. Phytoplankton productivity levels identified. Eutrophication responses by microalgae largely quantified.
2	There still seem to be chasms between generator, user, enforcer and compliance. If read 'in toto' I do not understand the second and third statements. What sort of research are we talking about?
3	National Estuary Management Protocol & Estuary Management Plans Estuarine Management Training
4	Understanding the ecosystem functioning of temporarily open/closed estuaries, which constitute over 70 % of estuarine types in SA and are prominent in other parts of the World, was the main area of my research under WRC funding.
5	Ecosystem services delivered by wetlands and the enterprise opportunities associated with these services
6	Funding allows me to keep up to date with latest research issues internationally so that our knowledge of estuary function and management is always up to date. Equipment is always an issue though to carry out the necessary research.
7	There has been a major research focus on the role of fresh water inputs to the structure and functioning of different types of estuaries and this has informed DWA ecological reserve legislation and other management initiatives.

8	NATIONAL WATER ACT A number of research programmes funded by the Water Research Commission contributed to the understanding of the environmental water requirements of estuaries. This work has attracted international interest. SANBI – Biodiversity Act The National Spatial Biodiversity Assessment has identified those estuaries which require protection for biodiversity conservation. Estuary research funded by WRC has provided input on Biodiversity. SAEON (South African Environmental Observatory Network) is developing a database for the storage of all estuary data to ensure long-term conservation and management of estuaries. This is co-funded by WRC. DEA – Marine Living Resources Act, research has also had an input here. CAPE Estuaries programme - must of the research in the Eastern Cape Estuaries Management programme funded by WRC has provided the tools for this programme e.g. estuary management training course, detail on estuary legislation. This research also provided input to Integrated Coastal Management (Act 24 of 2009) which requires the development of Estuary Management plans for all SA estuaries.
9	Estuarine Reserve Determinations

Research Provider: Question 10

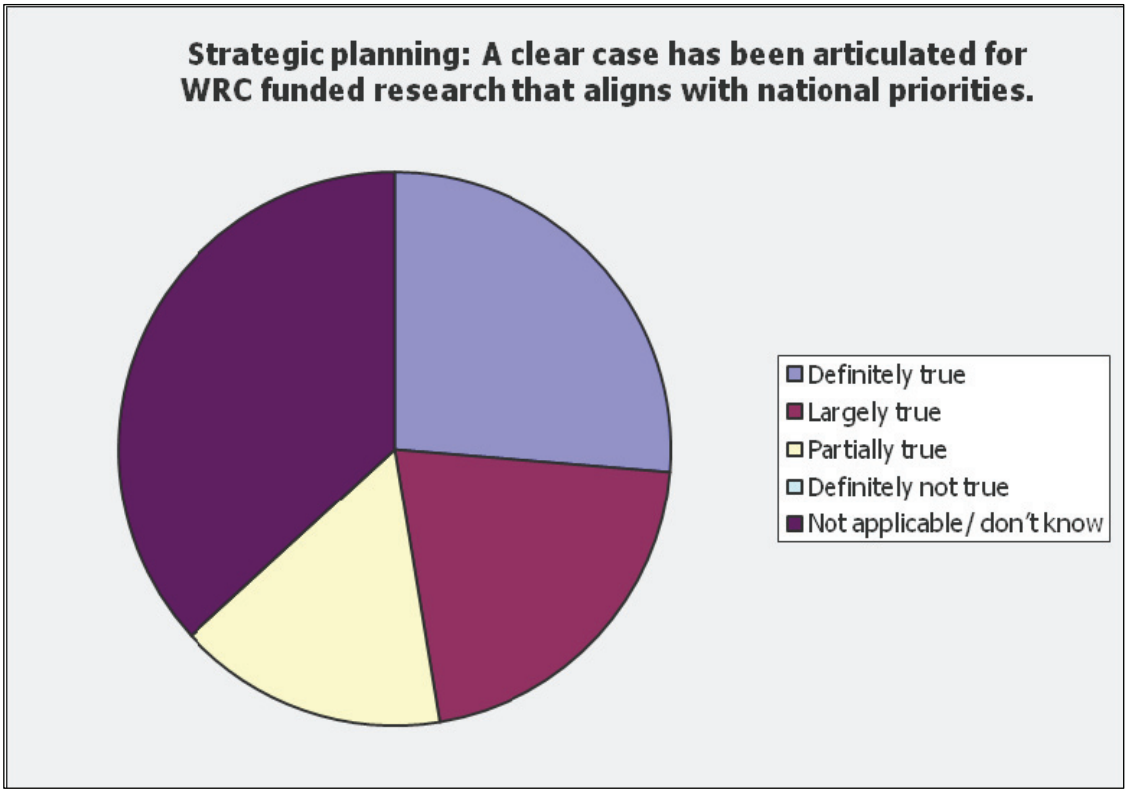
Strategic planning: A clear case has been articulated for WRC funded research that aligns with national priorities.

Answer Options	Response Percent	Response Count
Definitely true	26.3%	5
Largely true	21.1%	4
Partially true	15.8%	3
Definitely not true	0.0%	0
Not applicable/don't know	36.8%	7
List the national priorities that have been aligned with research		11

List of National priorities is presented below

Respondents	National priorities that have been aligned with research
1	Fresh water requirements of estuaries. Effects of estuary mouth closure on marine inshore productivity.
2	Water use and management Research for sustainable functioning of ecosystems

3	This would need background that is not readily available to the average estuarine researcher.
4	Understanding and promoting the importance of estuaries.
5	Food security Health and safety
6	Sustainable water resources Water provision and sanitation Environmental rehabilitation
7	Water resource conservation Rural livelihood improvement
8	DWA environmental legislation pertaining to estuaries.
9	Protection of SA's water resources including estuaries for use.



Research Provider: Question 11

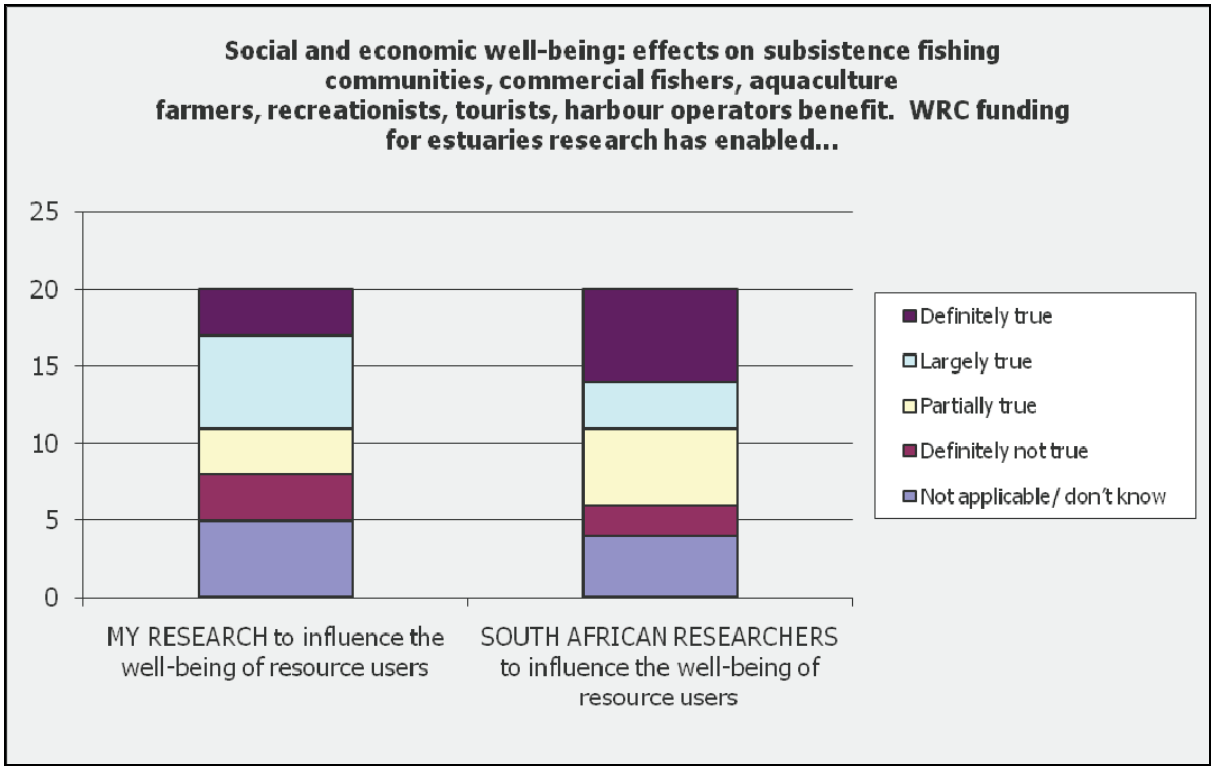
Social and economic well-being: effects on subsistence fishing communities, commercial fishers, aquaculture farmers, recreationists, tourists, harbour operators benefit. WRC funding for estuaries research has enabled...

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
MY RESEARCH to influence the well-being of resource users	3	6	3	3	5	20
SOUTH AFRICAN RESEARCHERS to influence the well-being of resource users	6	3	5	2	4	20
Provide examples						12

Examples and comments listed below

Respondents	Examples
1	Primary productivity is at the base of the estuary food chain. ALL productivity within estuaries is tightly aligned to the capability of the microbial community to function maximally. Both physical and zoological researchers are now well aware of the importance of the microbial component in estuaries.
2	Clear examples of the application of research results or the beneficial influence of researchers in the above situations are pretty limited - in fact I cannot think of any.
3	Our research is entirely based on the well-being of estuary users.
4	Development of Estuary Management Plans to allow for optimum use of estuarine resources (This concept was first developed as part of a WRC project).
5	The full impact of eutrophication in the Durban peri-urban estuaries were highlighted through our research project. This led to the municipality eventually engaging in a project of redirection of sewage treated effluents away from key estuaries in the region.
6	I am currently involved in a WRC research project on ecosystem services delivered by wetlands and the enterprise opportunities associated with these services. Although I have scored the two questions contained in 11, it is probably premature to judge the level to which the research has enabled because it is still in progress
7	A gap exists between researchers, their findings and the layman.
8	More equitable allocation of estuary based resources
9	By identifying the importance of maintaining sufficient freshwater inputs to estuaries we have assisted scientists involved in RDM studies to allocate appropriate environmental water reserves for estuaries. The identification of optimum riverine inputs (quality and quantity) for the continued ecological functioning (and productivity) of estuaries has a positive influence on the socio-economic value of these systems.

10	I am not aware of any projects funded by the WRC dealing with the above fishing sectors?
11	Healthy well managed estuaries provide important goods and services which contribute towards social, economic and health benefits.
12	Not WRC, BUT EU funding achieved the goal to influence well-being of aquaculture resource users in China. see http://www.biaoqiang.org/



Institutions and benefits are presented below

Research Provider: Question 12						
Capacity for adoption: End user partners ensure they have in-house capacity to engage in the research process and to absorb and utilize relevant new knowledge.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the development of INSTITUTIONAL CAPACITY	5	2	8	2	3	20
List institutions and benefits						12

Respondents	Institutions and benefits
1	All universities along the coast and RU. DWA, MCM, Cape Conservation, EKZN Wildlife and coastal provincial governments. The foregoing know where and how to access estuary research information.
2	Not really seeing the information and research translated into end user capacity
3	I hope I am wrong but I have not seen any evidence anywhere - surely again WRC know where their money is going and what is being done with it and can point to graduating students, creation of research institutes or chairs?
4	It is likely that municipal and governmental bodies, community groups, NGO, as well as the private sector will benefit from our research.
5	The WRC funded the Introduction to Estuary Management training module. This is currently being rolled out under the FETwater programme (accredited by NMMU). The following institutions have attended: DWA, DEA, CapeNature, SANParks, Eastern Cape parks, KZNWildlife, DEADP, CMAs, MCM, NMMU, UWC, UKZN, Durban metro, Cape Metro
6	Estuarine ecologists trained within our project are now serving in at least 3 key departments of the eThekwini Municipality, the eastern Cape Province and the national Department of Science and Technology, respectively.
7	A few local organizations that have been involved at selected estuaries appear to have had their capacity built as well as a few individuals in provincial and national departments, e.g. DEAT. However, beyond this it is difficult for me to say if there has been much more impact as yet. I am not sure, for example, as to the extent to which the estuary management handbook has been widely applied and assisted in building capacity.
8	Where there is existing capacity in local, provincial and national government these organisations have been able to enhance their institutional capacity from the knowledge delivered by us. However, where there is limited capacity, particularly in local government, there has been limited take-up.
9	Some municipalities and government departments
10	Whilst the scientists and students involved in estuarine research have developed a capacity to absorb and utilize the new knowledge, the same cannot be said of managers and legislators who have not been directly involved in these studies.
11	Department of Water Affairs - understanding of the environmental water requirements of estuaries MCM, DEA, Cape Nature - input to estuary conservation and management
12	Economic valuation of estuaries a small niche market activity pursued by academics and a few consultants. Very limited supportive institutional capacity to absorb these findings and translate into action.

Research Provider: Question 13						
Co-location: End users are prepared to host post-graduate students and research staff to enable them to conduct their research in real-world contexts. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
The willingness of RESEARCH USER INSTITUTIONS to employ qualified research personnel /research students	1	4	8	3	4	20

There are no additional comments for this question.

Research Provider: Question 14						
Capacity building: Students and early career researchers are mentored, as measured by the number of research higher-degree students and post doctoral fellows involved. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY CONTRIBUTION to capacity building	6	3	5	2	4	20
Capacity building in South/southern Africa	5	7	3	0	4	19
Capacity building further afield	2	0	6	1	10	19
Please indicate the number of Masters and PhD students you have supervised with support of WRC funding						14

Comments are presented below

Respondents	Number of PhD and Masters students supported by WRC funding
1	~ 10-15.
2	None with WRC funding but in the last five years have supervised 3 Honours & 3 Masters students in estuarine ecology.
3	One M.Sc.
4	1 Honours 1 M.Sc.
5	WRC project formed the basis of my MSc.
6	4 MSc, 1 PhD

7	Currently supervising 1 PhD student. I have only very recently become involved in working with estuaries, and most of my research is still focussed on inland wetlands.
8	The research projects I have managed over the past 10 years have generated approximately 20 masters and PhD graduates (they were not supervised by me.)
9	I was not specifically involved in supervising students but rather had the opportunity to involve new professionals in estuary research.
10	At least 1 MSc and 1 PhD from a personal perspective but numerous MSc and PhD students have benefitted from multi-disciplinary projects (funded by the WRC) that I have led.
11	6 MSc students, other 10 from NRF funding 5 PhD students

Research Provider: Question 15

Organizational research capacity: Research users support the capacity and availability of their staff to engage with the external research community. WRC funding for estuaries research has had a significant, positive impact on:

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
The ability of RESEARCH PROVIDERS to build in-house scientific capacity to effectively engage with the external research community	4	1	5	1	9	20
List research users that are available to host researchers						7

Comments are presented below

Respondents	Research users that are available to host researchers
1	Training programmes Student training
2	CSIR
3	CSIR supports this model, e.g. Lara van Niekerk, Susan Taljaard, Andre Theron.
4	KZN Wildlife eThekwini Municipality Department of Science & Technology
5	Mainly provincial and national government
6	From research can provide consultancy input to DWA and other government department

Research Provider: Question 16						
Scientific capacity: Funds have been allocated for mentoring, advancement of facilities, inter-project learning, and creative opportunities to advance disciplinary, interdisciplinary and transdisciplinary science.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funded estuaries research has had a significant, positive impact on transdisciplinary scientific capacity in South Africa	5	4	6	1	4	20

There are no additional comments for this question.

Research Provider: Question 17						
Adaptive decision-making and policy revision: End users have the processes and flexibility to incorporate new research findings into their decision-making, strategic planning and policy where relevant.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the incorporation of research into decision-making, strategic planning and policy.	4	3	8	0	4	19
List key areas of influence						10

Key areas of influence are presented below

Respondents	Key areas of influence
1	RDM freshwater requirements
2	Freshwater abstraction or damming of rivers feeding estuaries
3	Ecological Flow Requirement Methods for Estuaries, new insights (e.g. REI zone) are implemented as information becomes available National Estuary Management Protocol & Estuary Management Plans
4	RDM workshops and implementation Estuarine monitoring programme
5	RDM and Estuary Management Plans as part of municipalities Integrated Development Plans.

6	National and provincial estuary management policy
7	DWA RDM Workshops on individual estuaries.
8	WRC research provided much of research for the ICM Act and estuary management plans as well as the environmental water requirement method for DWA.
9	Estuarine Reserve Determination

Research Provider: Question 18

Adaptive learning: Feedback from project evaluations and program assessments is being used to improve processes, relationships and behaviours.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
WRC funding for estuaries research has had a significant, positive impact on adaptive learning at NATIONAL SCALE	2	2	4	0	12	20
List assessments and evaluations that have involved participation at national scale						5

Comments are presented below

1	Steering committees meetings Reports Ad-hoc and special workshops
2	Ecological Flow Requirement Methods for Estuaries National Estuary Management Protocol & Estuary Management Plans
3	CERM had a system of workshops, after one project was completed the next multi-disciplinary programme was then formulated.

Research Provider: Question 19						
Continuity: End users maintain commitment and engagement to WRC funded estuary research.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on INSTITUTIONAL COMMITMENT to estuary research	1	5	2	1	10	19
List institutions that have shown commitment						8

Institutions that have shown commitment are presented below

Respondent	Institutions that have shown commitment
1	NMMU, UKZN, RU, UZULU, CSIR, DWA.
2	The eThekwini municipality has significantly sponsored estuarine research in their area but I did not see this arising out of WRC funding.
3	Community Groups Environmental Departments (DEAET) (to a degree) UKZN
4	DEA: Marine and Coastal Management DWA, RDM office
5	eThekwini Municipality KZN Wildlife
6	DEAT, CapeNature, Buffalo City Municipality, eThekwini Municipality
7	The NRF have allocated bursaries to numerous postgraduate students involved in WRC sponsored estuary research.
8	Water Affairs

Research Provider: Question 20						
Continuity: funding and consistent leadership has been established that is conducive to long-term research.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC estuaries research has had a significant, positive impact on long-term research in South Africa	5	3	9	2	1	20
List national long term estuary research programs of which you are aware						12

National Estuary Research Programs are listed below

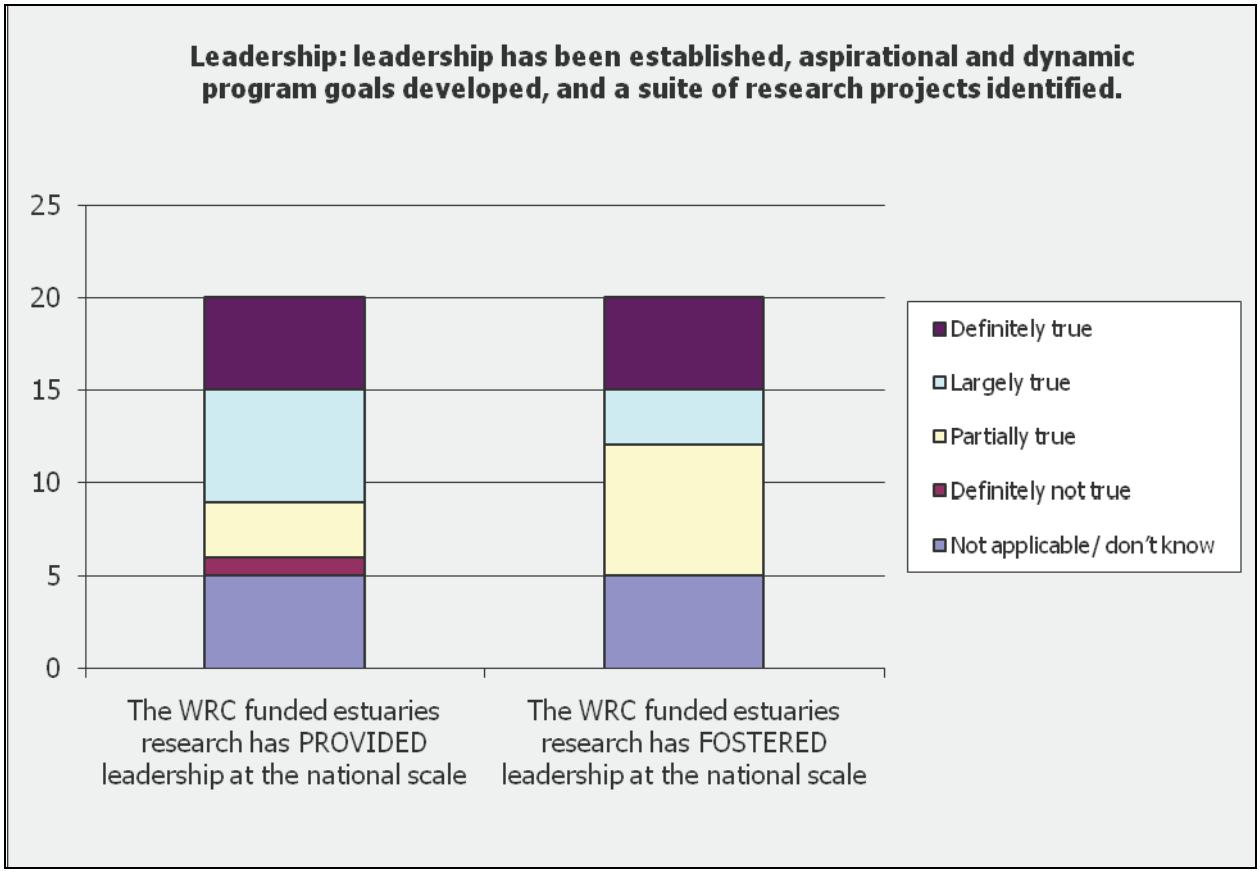
Respondents	National Long Term Estuary Research Programs
1	Most multidisciplinary and multi-institutional estuary research in RSA has emanated from WRC commitment.
2	I am not aware of any which are a result of WRC estuarine research
3	I do not know of any instances of long term WRC sponsored estuarine research. DWEA are now talking of a national long term estuarine monitoring programme to be developed over the next 5 years.
4	The C.A.P.E. Estuaries Programme
5	The C.A.P.E. Estuary Management which is testing the National Estuary Management Protocol & Estuary Management Plans. It is funded by GEF, DWA and DEA:MCM.
6	Estuarine monitoring programme (still in development phase)
7	Eastern Cape Estuaries Programme
8	SeaChange SEAON
9	Eastern Cape Estuaries Management Programme (11 years)
10	The involvement of CERM in WRC funded research projects has provided continuity both in terms of funding from WRC and the leadership associated with these projects.
11	Long-term funding for research and monitoring on a particular system has not occurred.
12	No broad-based long-term research on the economic value of estuarine services

Research Provider: Question 21

Leadership: leadership has been established, aspirational and dynamic program goals developed, and a suite of research projects identified.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
The WRC funded estuaries research has PROVIDED leadership at the national scale	5	6	3	1	5	20
The WRC funded estuaries research has FOSTERED leadership at the national scale	5	3	7	0	5	20

There are no additional comments for this question



Research Provider: Question 22						
Flexibility: Research projects and teams have freedom to explore modes and structures of practice within appropriate limits of scientific and financial accountability.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
The flexibility of WRC funded estuaries research has had a significant, positive impact at national scale on researcher freedom to explore modes and structures of practice	7	5	4	0	3	19

There are no additional comments for this question

Research Provider: Question 23		
Overview Opinion WRC funded research has had a significant positive influence on the knowledge base of estuaries		
Answer Options	**Response Percent**	**Response Count**
Definitely true	55.0%	11
Largely true	20.0%	4
Partially true	15.0%	3
Definitely not true	0.0%	0
Not applicable/ don't know	10.0%	2
Examples and comments		13

Examples and comments presented below

Respondents	Comments
1	To my knowledge, 90% of estuary research that has applicability to estuary management has come from funds provided by WRC. Much basic research has also been provided by NRF funding, but much of this has not been multi-institutional. It is this multi-institutional research that, to my mind, has had the greatest long-term influence on estuary management strategies.
2	This is true and is made obvious by the vast number of WRC reports on all aspects of estuarine structure, function and management.
3	Too many to list - many ecological reserve studies
4	Much research in the past has been based on the ecological aspect of estuaries. Our research has built on the social impacts which surround the sustainable use of estuaries.
5	Yes, we have a more in-depth understanding of how estuaries work (e.g. research on the importance of the river-estuarine interface) and getting better at linking the human-estuarine system so as to allow for integrative decision making process.
6	Knowledge on temporarily open/closed estuaries was virtually non-existent in many areas prior to the inception of the WRC funding programme.
7	My perception is that this has been particularly evident in the E Cape, but I am peripherally involved in estuarine research and therefore it is difficult for me to comment broadly
8	Research on estuaries is generally under-funded. WRC is the only significant funder in an environment of under-funding.
9	A large section of estuary research in the country has taken place through WRC funding.
10	This is one example of how the WRC supported the communication of the knowledge base on South African estuaries: Whitfield, A.K. 2000. Available scientific information on individual South African estuarine systems. Water Research Commission Report No. 577/3/00, 217 pp.
11	Through the funding of WRC, CERM (Consortium for Estuarine, Research and Management) was formed. CERM has over 200 members, mostly South Africans, but also African and overseas members. Research projects funded by the WRC have investigated the freshwater inflow requirements of

	estuaries. and addressed the National Water Act (Act 36 of 1998).
12	especially in terms of integration at multi-disciplinary projects

Research Provider: Question 24

Overview Opinion: Knowledge generated through WRC research has had a significant positive influence on the management of estuaries.

Answer Options	Response Percent	Response Count
Definitely true	35.0%	7
Largely true	25.0%	5
Partially true	20.0%	4
Definitely not true	10.0%	2
Not applicable/ don't know	10.0%	2
Provide an example		12

Examples of WRC research that has had a positive influence on the management of estuaries are presented below.

Respondents	Examples
1	Data used in all RDM studies has come largely from WRC funding.
2	Transfer of the excellent information contained in WRC reports is not translated to action on the ground
3	I know of only one instance of active management (re-routing of waste water from the Mhlanga sewerage works - presently on hold) where the intention is to actively reverse adverse anthropogenic effects. There was WRC sponsored research on this system but on a national scale the influence has been minimal - this does not necessarily reflect adversely on the WRC but rather on the total inadequacy of legal enforcement of existing legislation.
4	The tool we have developed will aid in the sustainable use of estuaries.
5	Updating and improving the Ecological Flow Requirement Methods for Estuaries Influenced the Integrated Coastal Management Act to include a chapter on estuaries, e.g. National Estuary Management Protocol & Estuary Management Plans Opening up the field of: Flow requirements of the Marine Environment. This will in the end require some policy shifts to include the marine environment in the National Water Act.
6	Lack of capacity and enforcement have largely prevented the implementation of management strategies derived from the new knowledge acquired.
7	Introduction of RDM incorporated into National Water Act.
8	It was primarily WRC funding that resulted in the national protocol and processes for estuary management

9	Van Niekerk, L., Bate, G.C. & Whitfield, A.K. (eds) 2008. An Intermediate Ecological Reserve Determination Study of the East Kleinemonde Estuary. Water Research Commission Report 1581/2/08, Pretoria.
10	WRC research has developed: An importance rating for South Africa's estuaries which ranks the estuaries according to their biodiversity importance and assists in conservation and water management decisions. Estuarine water quality database that contains information on the response of biota to changes in water quality. This database summarises all available information and is an essential tool for setting the water quality requirements of estuaries. An understanding of the responses of the biota to flow variation and mouth condition in permanently and temporarily open/closed estuaries both in the Cape and KZN. Direct input was provided to the CAPE estuaries management programme.

Research Provider: Question 25

The following indicators have been used to structure this questionnaire. Please indicate their relative importance for you by ranking them, with 1 BEING THE MOST IMPORTANT to 10 being the LEAST IMPORTANT.

Answer Options	1	2	3	4	5	6	7	8	9	10	Response Count
Research excellence	7	2	4	1	0	0	0	0	2	2	18
Discourse	2	1	3	1	0	3	0	3	0	4	17
Knowledge sharing	3	5	1	3	1	0	2	2	1	0	18
Communication	0	1	3	3	2	0	4	2	0	2	17
Relevance	5	2	0	3	5	1	1	1	1	0	19
Social/economic well-being	1	1	3	2	2	4	2	0	4	0	19
Capacity	0	3	4	2	2	2	1	2	0	2	18
Continuity	1	0	0	1	1	3	2	4	2	3	17
Leadership	0	2	0	2	4	0	4	2	2	1	17
Flexibility	0	2	1	0	1	4	1	1	5	3	18

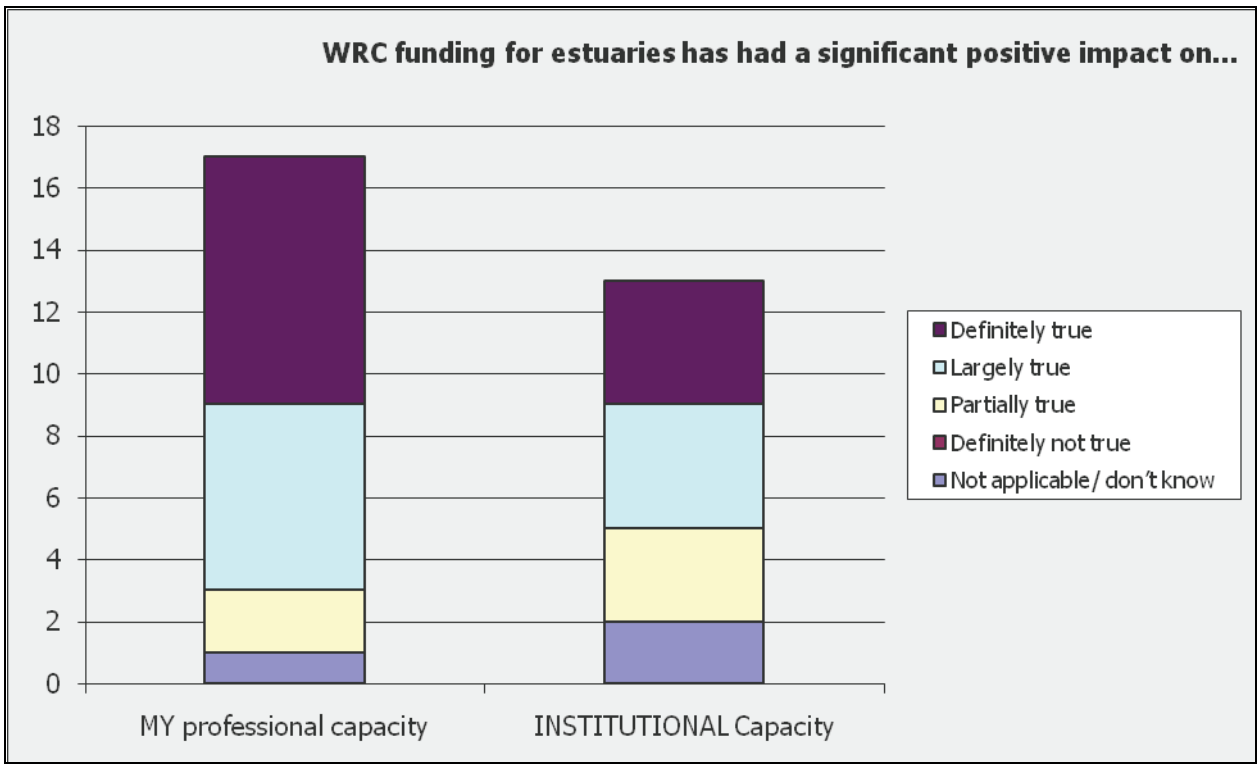
Research Users

Research User: Question 1						
Capacity for adoption: End user partners ensure they have in-house capacity to engage in the research process and to absorb and utilize relevant new knowledge. WRC funding for estuaries research has had a significant, positive impact on the development of...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY professional capacity	8	6	2	0	1	17
INSTITUTIONAL Capacity	4	4	3	0	2	13
List key areas in which YOUR capacity has been enhanced						15

Areas in which respondents' capacity has been enhanced are presented below

Respondent	Key Capacity areas
1	Consistent source of research reports to enhance understanding of estuarine function - reports are used as literature base for the monitoring and research activities which we conduct in our own capacity or on behalf of government/private companies and in the production of management advice
2	estuary and water management
3	Access to publications on Estuary Management helped me to develop a methodology for preparation of Estuary Management Plans
4	I have used WRC research findings for my Honours BSc Geography research proposal assignment with UNISA.
5	Better understanding the delivery of ecosystem services by estuaries and how these can be accounted for in a management and enterprise development situation by using a rapid scoring system. Risk assessment in the context of estuary based enterprise development
6	To lead and conduct estuary management planning and related processes. To communicate estuary management and related processes to society An increased appreciation of the social dimensions of management
7	We are more aware of the economic opportunities available. We still are not aware of how to actually develop these in rural areas.
8	Understanding of ecological dynamics in the estuarine system, species habitat requirements, diversity and impacts associated with drought, habitat destruction and altering.
9	in respect to the role of local estuary planning as well as linking estuary planning to economic opportunities. Also understanding ecosystem goods and services
10	Having knowledge of how sensitive the estuarine environment is with respect to users (recreational)

	Having to understand that not only you can use an estuary for recreation, but you can extend it to use as a site where you can grow fish and other salt loving life.
11	Access to information on individual systems. Access to information on general estuary ecosystem functioning. Access to information on estuary management (issues and ways of dealing with them).
12	Understanding the behaviour of temporary open/closed estuaries Knowledge about the role of estuaries in fisheries Knowledge about the freshwater needs of estuaries
13	Through books, papers & documents. I also attended the course on Estuarine Management at NMMU last year.
14	Integrated catchment management Freshwater requirements of estuaries Estuarine ecology and management
15	My capacity has been enhanced especially in making better and informed decisions and recommendations regarding how the estuaries should be managed. Secondly, to effective provide inputs into research (through my exposure as be steering committee member on few WRC project)



Research User: Question 2						
Discourse: Staff from end user organizations and community members dedicate time to make meaningful contributions to the strategic direction of WRC funded research. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY willingness to dedicate TIME for meaningful contributions	5	3	6	0	2	16
The discourse to determine the strategic direction of research in South Africa	1	4	4	1	5	15
List up to three strategic initiatives YOU have engaged with commitment						13

Strategic initiatives respondents have engaged with commitment are presented below

Respondents	Strategic Initiatives
1	1.economic value of estuaries 2.litter extraction from storm water systems 3.estuary management
2	CAPE Estuaries Programme - First Review Workshop (July 2009)
3	I am very new to estuary research and my only involvement thus far is in a single project on ecosystem services delivery and estuary based enterprises.
4	Eastern Cape Estuaries Management Programme Guidelines on various estuary management issues (economics and freshwater, sedimentation, etc)
5	economic opportunities project
6	1.Uthungulu Coastal Management Forum 2.uMhalthuze State of the Environment and Environmental Framework 3.North Coast Wetlands Working Group
7	I have engaged in the Eastern Cape Estuaries management programme as a steering committee member as well as reviewing proposals received and being a steering committee member for the current economic impacts and estuaries project
8	I was part of the Chalumna (Tyolomnqa Estuarine Forum) which got funds from DEAT and other organisation like NEDBANK. This initiative form part and education to myself and the communities embounding the Chalumna Catchment & Estuarine environment.
9	1. INR Eastern Cape Estuaries Programme. 2. C.A.P.E. Estuaries Programme - Gamtoos, Gouritz, Swartkops, Keurbooms, Mbashe, Mtentu, Msikaba
10	I generally consider WRC funded projects as important as I believe that they have been through a solid planning phase and are overseen by a steering

	committee. As a result I am inclined to use my time to support such a project. I have been on a steering committee of the project studying the freshwater/estuary interface
11	I have taught many pupils since 1985 on the Swartkops Estuary. During the last 10 years this has increased so to the extent that I have now trained Xhosa speaking people to help with classes which are mainly to the children of Motherwell, which is on the banks of the Swartkops. I have compiled extensive notes for these teachers to help them. I have just compiled a "Swartkops Field Guide" to help educate the teachers & pupils from the schools we teach.
12	1.Estuary classification workshops 2.Freshwater requirements of estuaries
13	The development of estuary management plans in South Africa

Research User: Question 3

Discourse: Events have been programmed and funded to develop and sustain discourse to strengthen relationships between research providers, research users and the wider community to inform and contextualize the research.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
WRC funding for estuaries research has a program of events that sustain relevant discourse at national scale among research providers, research users and the wider community	2	3	2	3	6	16
List recent events that have had national participation						9

Respondent	Events with national participation
1	National (SAMSS, SASAQS) and international conferences (WIOMSA) have been held in SA in recent years which have included estuarine topics - I am unaware of any WRC involvement in these but I would expect that there should be.
2	A national workshop convened within the research project on ecosystem services delivery and estuary based enterprises.
3	Chalumna Estuary Forum
4	C.A.P.E. Estuaries Programme.
5	International Coastal Cleanup World Wetlands Day National Water Week & National Marine Week

Research User: Question 4

Adaptive decision-making and policy revision: End users have the processes and flexibility to incorporate new research findings into their decision-making, strategic planning and policy where relevant. WRC funding for estuaries research has had a significant, positive impact on...

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
MY INFLUENCE on incorporation of new research findings	7	3	2	0	3	15
The incorporation of research into decision-making, strategic planning and policy	9	2	0	1	3	15
What are the key areas of influence?						11

Comments on key areas of influence are presented below

Respondents	Key areas of Influence
1	Data and status assessments generated by MER have been fed into the environmental management structures of the eThekwini municipality, which is probably the most active municipality in the country in this regard. DWEA and DAEA, and to a lesser extent EKZNW, have shown little initiative is using estuarine knowledge.
2	National and provincial coastal management policy, and, where there is capacity, local estuary management practices.
3	I cannot think of anything that has come out of WRC estuary research project that has been incorporated into management strategic thinking.
4	Estuary management, alien weed control, invasive species.
5	content of estuary management plans and determination of current and future states
6	This initiative is a positive step in a right direction. It is to make public aware of the importance of our estuaries. Both on open and closed river systems.
7	Incorporating research findings into Estuary Management Plans, i.e. practical application.
8	Understanding the importance of TOCEs. RDM - the setting and monitoring of these
9	I do not know what the WRC has or is doing in the Swartkops Estuary. I have never heard of you before!
10	Integrated catchment management Freshwater requirements of estuaries Estuarine ecology and management

Research User: Question 5						
Continuity: End users maintain commitment and engagement to WRC funded research. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY COMMITMENT to ongoing engagement with estuary research	7	3	4	1	1	16
INSTITUTIONAL COMMITMENT to estuary research	3	6	2	0	5	16
What are some of the factors that encourage commitment?						13

Factors that encourage commitment and listed below

1	The WRC has had very little effect on my commitment and I see very little generation of institutional commitment.
2	Willingness to engage meaningfully with end users to draw on their experience in order to improve the research products.
3	A sense that one is making a meaningful contribution
4	The main commitment comes from being both a research provider and user. I can use the tools we create.
5	I am really keen to integrate research fundings into management. I would suggest that a National Estuary Management Forum is set up and that managers het the opportunity to identify their priority areas that require research. In this way we will really make a difference.
6	Qualification of researchers, track records, quality of reports and interaction.
7	user friendly, relative and applied research outcomes
8	With this initiative for instance, It will assist the public and regulators in understanding the importance of the Estuary. For instance there are Towns or developments situated right on estuarine environment e.g. Port Alfred Town is on Kowie River Estuary. Currently this town is expanding and requires that its wastewater treatment works to treat and discharge approximately 5000 000 L of treated effluent per day. Now the problem we are sitting with is how do we accommodate the Kowie River Estuary requirement as a recreational activity site; as a place where people have put in cages to grow fish and other salt like activity (life). We do know understand that there is various options on which we can authorise the discharge: e.g. allow discharge when the tide is going out to see. Or authorise the discharge on special standards on nutrients. Or prohibit discharge and ask the Local Authority to treat effluent and re-use for potability. We are hoping that this initiative will answer some of the above questions.
9	1. Many management actions required for estuaries need to based on sound scientific research/data; by engaging with recent research and scientists I have access to information that enhances the effectiveness and credibility of

	management recommendations. 2. Not all institutions are committed to estuary research; many only have select members within that are committed.
10	A well controlled research process including: Good project description, good evaluation of the projects, good steering, good financial control, keeping to completion time, high quality of the reports produced and easy access to reports
11	We are mostly volunteers who by nature are committed to what we do - despite all odds. We live here & want the Swartkops to be an asset to Port Elizabeth & used sustainably by all. Research really needs to be done here prob. by NMMU & we could do more to educate people if we all had funding. However, never having had funding, we just carry on regardless.
12	WRC research addresses relevant applied aspects and hence has practical relevance
13	To capacitate my understanding of these dynamic systems as my legislative mandate requires me to manage these system and you can't do that without their proper understanding and secondly scientific research is dynamic as well- to learn new approaches to estuarine understanding

Research User: Question 6

Continuity: funding and consistent leadership has been established that is conducive to long-term research.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
WRC estuaries research has had a significant, positive impact on long-term research in South Africa	5	3	3	2	3	16
List national long term estuary research programs of which you are aware						12

National Estuary research programs are listed below

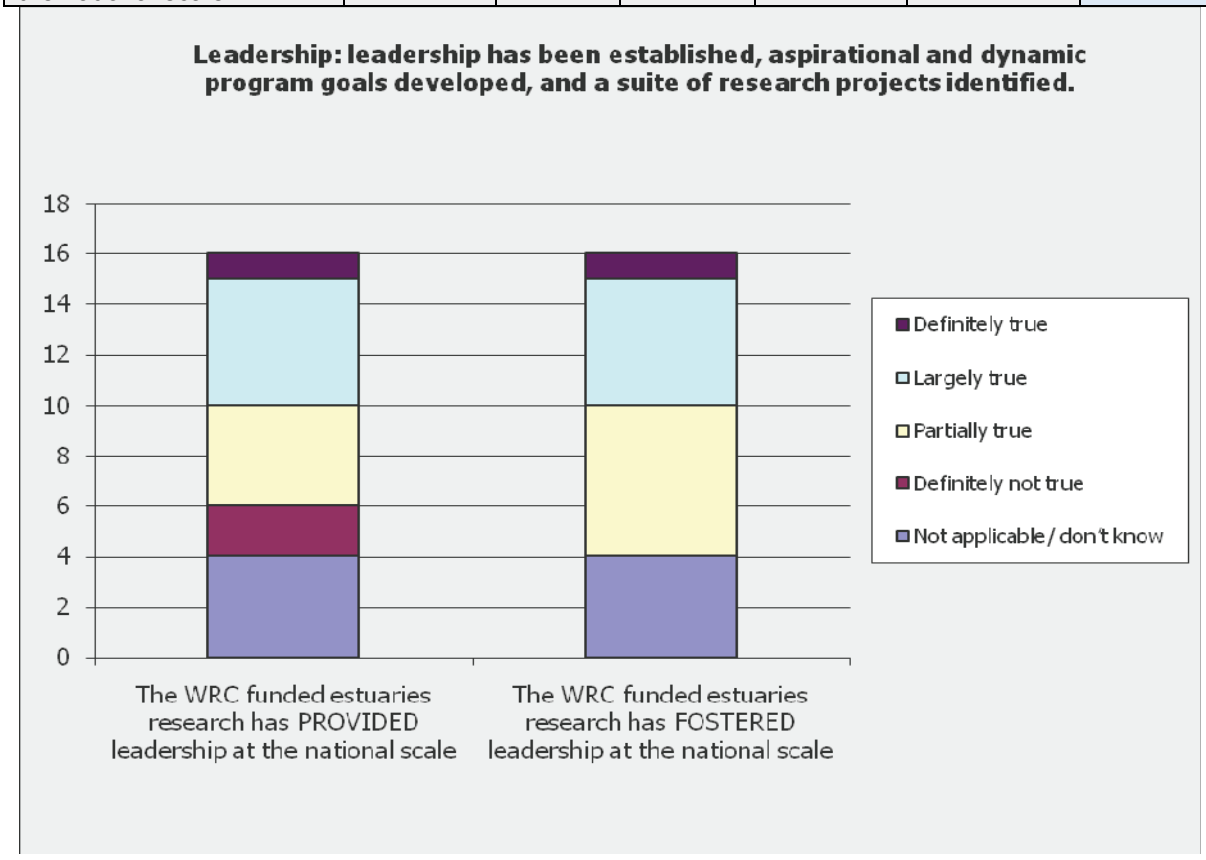
1	Apart from the fish surveys carried out by Harrison in a large proportion of SA estuaries in the late 90s, there has never been a long term survey that I know of, apart from possibly the East Kleinemonde, of any one estuary never mind a selection from our total complement of estuaries. As mentioned previously there are now initiatives to institute a national programme but the questions of which, who, what and how remain unresolved.
2	Eastern Cape Estuaries programme
3	Eastern Cape Estuaries Management Programme
4	Nhlabane Estuary Monitoring Programme

	Coastal and Estuarine Research and Monitoring (CERM) Committee, chaired by Prof Guy Bate
5	CAPE programme, Eastern Cape Estuary Management Programme
6	Integrated Management Plan for the Swartkops
7	Integrated catchment management Freshwater requirements of estuaries
8	none, all short term projects

Research User: Question 7

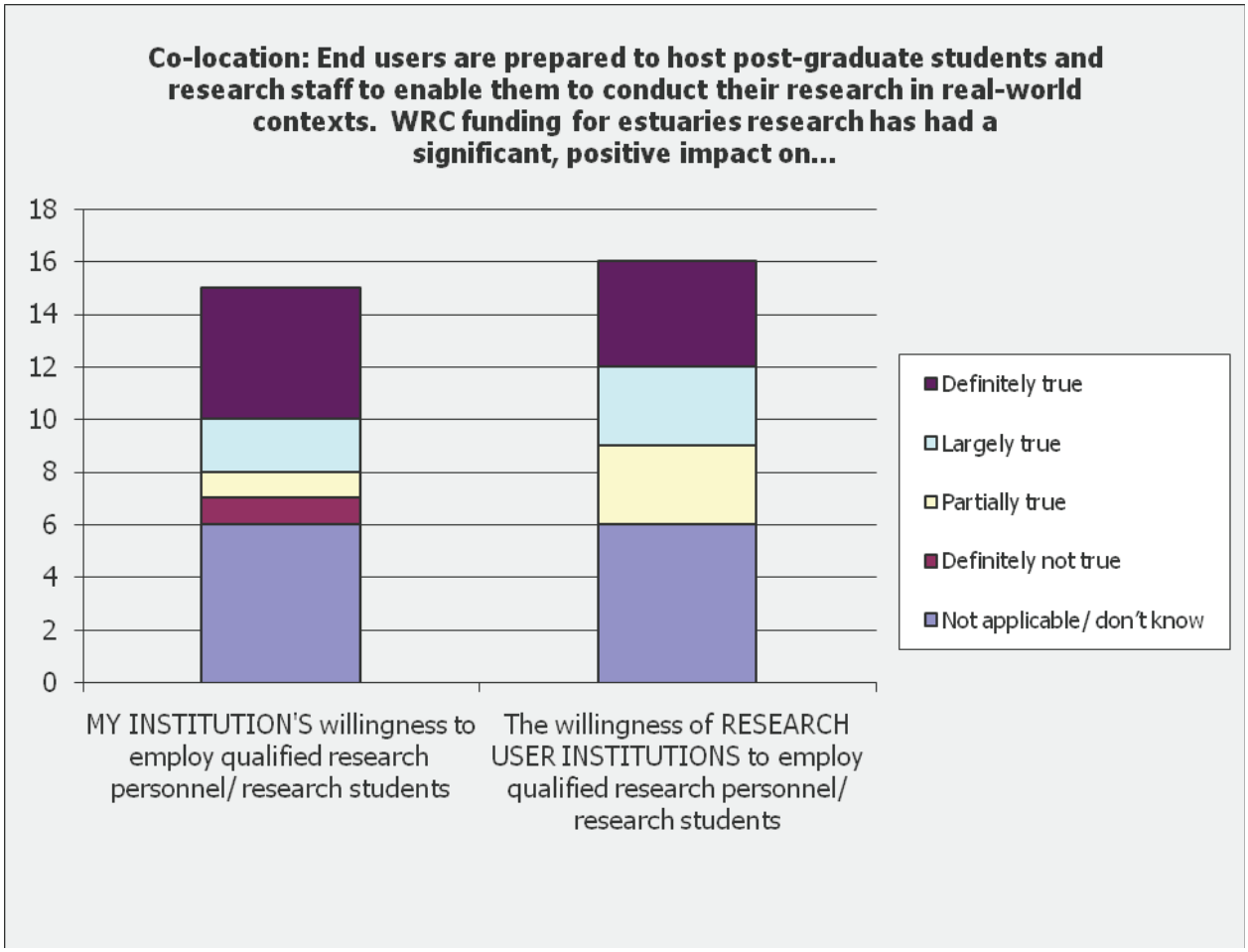
Leadership: leadership has been established, aspirational and dynamic program goals developed, and a suite of research projects identified.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
The WRC funded estuaries research has PROVIDED leadership at the national scale	1	5	4	2	4	16
The WRC funded estuaries research has FOSTERED leadership at the national scale	1	5	6	0	4	16



Research User: Question 8						
Co-location: End users are prepared to host post-graduate students and research staff to enable them to conduct their research in real-world contexts. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY INSTITUTION'S willingness to employ qualified research personnel/research students	5	2	1	1	6	15
The willingness of RESEARCH USER INSTITUTIONS to employ qualified research personnel/research students	4	3	3	0	6	16

No additional comments or examples for this question



Research User: Question 9						
Organizational research capacity: Research users support the capacity and availability of their staff to engage with the external research community. WRC funding for estuaries research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY SUPPORT for staff to engage with research and the research community	4	1	2	1	7	15
The availability of RESEARCH USERS to build in-house scientific capacity to effectively engage with the external research community	6	2	4	2	2	16
Comments						9

Respondents comments are presented below

1	Who are these research users? Where are the institutions? Are we talking about municipalities, universities, provincial conservation bodies?
2	I've been unaware of any such opportunities
3	My impression is that the large demands that are placed on potential research users together with the difficult institutional environment in which they operate (often leading to despondency) limits meaningful engagement with external research community
4	I really believe in creating capacity within Government. I would support this 100%. The support is however based on my freshwater experience with the WRC. In this field managers actually participate WRC project management and products can be used - Protected Species Management Plan.
5	Yes it is true. Time and again staff benefit in the research and knowledge get provided through CSIR , Universities such as UCT, Rhodes, Port Elizabeth (Nelson Mandela Metro University) especially in the Eastern Cape Region.
6	Research increases my capacity and therefore enables me to engage with researchers from an informed position.
7	It is difficult to know how much the WRC-funded projects have shaped our knowledge of South Africa's estuaries. This knowledge and awareness has increased in the last decade - and hence our institutional attitude towards researchers.
8	As a consultant I have made use of WRC funded research reports
9	It is important to built an in-house scientific capacity as there are few estuarine experts within government departments. This is a

	highly specialized field and engaging with external research community is important as well as we don't have capacity to do research.

Research User: Question 10						
Scientific capacity: Funds have been allocated for mentoring, advancement of facilities, inter-project learning, and creative opportunities to advance disciplinary, interdisciplinary and transdisciplinary science.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funded estuaries research has had a significant, positive impact on transdisciplinary scientific capacity in South Africa	2	3	7	0	4	16
Comments						7

Comments are presented below

1	The only outputs that I am aware of are the guidelines documents on estuary management.
2	I am not in a position to comment for South Africa, but the WRC estuary research project within which I am currently working is strongly trans-disciplinary
3	Additional funding required in order to effectively implement this activity
4	The Department of Water Affairs through their water use license function. In some cases need to issue water use licenses on point source discharges into estuaries. Because an estuary is regarded as a sensitive environment. This then requires that a reserve be done which is to guide such a proposed discharge. I think WRC need to assist the Department with key specialist or assist in creating capacity to DWA for decision making or specialist input on the above.
5	Estuaries research needs to be based on an ecosystems-based approach, which requires cooperation and input from scientists from a variety of disciplines. Programmes feature scientists from a variety of disciplines and institutions.
6	WRC has funded multi- and inter-disciplinary projects

Research User: Question 11

Social and economic well-being: effects on subsistence fishing communities, commercial fishers, aquaculture farmers, recreationists, tourists, harbour operators benefit. WRC funding for estuaries research has enabled...

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
ME to use research to influence the well-being of resource users	3	5	4	1	4	17
SOUTH AFRICAN RESEARCH USERS to influence the well-being of resource users	3	3	4	0	7	17

Examples and comments are presented below

1	The information is often there but the translation into management understanding, enforcement and compliance is where the process breaks down.
2	The guideline documents for estuary management helped me to develop a methodology for preparation of two estuary management plans and the establishment of an estuary forum in the Overberg district, Western Cape
3	The WRC estuary research project within which I am currently working explicitly deals with the well-being of resource users, but I think that it is probably still too early to comment on its influence, but it would appear to at least to have had positive local influence in the case study sites used. This influence will hopefully expand.
4	More equitable access to estuary-based resources
5	economic opportunity project - we still however need a case study in a rural area (a new area not an existing programme.
6	I have applied techniques and incorporated information obtained in the development of estuary management plans and well as using research to inform specialist coastal comments given
7	Don't know - I use research findings to make management recommendations that regulate end users, but I honestly cannot say (remember), which research findings are a result of WRC funded programmes and which are not. All effective research, however, does allow me to influence the well-being (positively and negatively) of resource users.
8	The studies on fish and also on the RDM have provided the necessary background knowledge that influences this
9	I have accessed WRC funded research reports in compiling specialist reports for EIA projects on the southern Africa coastline
10	With the new WRC Project "estuaries and economic empowerment" we are looking at ways of giving effect to the recommendations of the project. The tool developed will be tested on some of the estuaries where management plans have been developed (in order to identify alternative or complementary alternatives to fishing)

Research User: Question 12						
WRC funding for estuaries research had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
The wider acknowledgement/ attainment of research excellence in South Africa	**7**	4	2	0	3	16
The global body of scientific knowledge	**6**	3	1	0	6	16
Wider perceptions of professionalism in research	5	3	3	0	4	15
Research users sharing knowledge with research providers	**5**	**5**	2	0	3	15
Research users sharing knowledge with research users	**6**	3	3	1	2	15
Research users sharing knowledge with research funders	3	**6**	1	0	5	15
The relevance of research for South Africa	**8**	2	1	0	4	15
The relevance of research outside of South Africa	1	3	1	1	**9**	15
Capacity building in South/southern Africa	**6**	4	2	0	3	15
Capacity building further afield	1	1	3	0	**9**	14
Opportunities for research findings to be communicated with society	**6**	1	4	0	3	14
Please provide comments or examples wherever possible						9

Additional comments and examples are presented below

1	Concern regarding perceptions of professionalism where not enough is done/no strong stance to protect the intellectual property of the WRC report writers.
2	The converted would be aware of what is happening, information would be shared etc but the comment in the box above is where the problem lies. In a water short country like ours there are major initiatives to extend forestry plantations in Eastern Cape areas - how is this reconciled with known impacts on river flows?
3	Guideline documents on estuary management - provided the opportunity to communicate research findings with society and for research providers (/users) to share knowledge with research users. Willingness of guideline document author to discuss approaches to estuary management with research user.

	This survey is an opportunity for research users to share knowledge with research providers.
4	Other than the economic empowerment project I am not aware of any other WRC based research.
5	Workshops and public feedback sessions on research and findings are ill advertised.
6	I had a privilege to be able to communicate with some of the countries specialists involved with the above: e.g. Drs Patsy, Adams, Oelofse and some extent Lara Van Niekerk.
7	1. WRC funded projects are known to provide useful information for practical applications. 2. I often communicate with research providers when applying their findings. 3. I regularly communicate with other research users, especially those involved with other estuaries within the C.A.P.E. programme. 4. I personally hardly ever communicate with research funders. 5. Relevance to the South African scenario is particularly relevant as all EMPs being developed are for SA estuaries; I have not applied research findings to estuaries outside of SA. 6. Research findings have increased my capacity to make informed management recommendations. 7. I communicate research findings with the community at workshops and in reports when justifying management recommendations.
8	Although I am aware of the general influence of WRC funded projects on estuarine ecology as an applied scientist I haven't been directly involved in WRC projects so can't comment with authority
9	Currently, most of the research is not primarily driven by research user (i.e. managers), Its primarily driven by research providers (scientists) due to scientific curiosity - its by chance that that the recommendations have management implications. Lastly, the results are not properly communicated to the broader society - mainly revolve around the small estuarine community.

Research User: Question 13						
Strategic planning: A clear case has been articulated for WRC funded research that aligns with national priorities.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funded estuaries research has a clear strategic orientation that is aligned with NATIONAL PRIORITIES	5	3	2	1	5	16
List the national priorities that have been aligned with research						8

A list of National Priorities are listed below

1	Guideline documents acknowledged the importance of socio-economic aspects of estuarine resource use
2	Biodiversity and water resource conservation Rural livelihood improvement Rural development
3	Once again a National Estuary Management Forum will get Government and research to identify priorities applicable to estuary management. If this is not done the overall priorities remain vague.
4	Protection and understanding of coastal processes
5	I believe research is currently focused on research interests and needs to be more applied and management related. I don't believe current research funding is guided by National Priorities
6	1. Ecosystems-based approach to research. 2. Research that is orientated towards management - research is useful for practical applications to real-life scenarios. 3. Research that provides an important component in the Reserve Determination process.
7	RDM, fisheries, water quality research
8	Integrated catchment management Freshwater requirements of estuaries

Research User: Question 14						
Flexibility: Research projects and teams have freedom to explore modes and structures of practice within appropriate limits of scientific and financial accountability.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
The flexibility of WRC funded research has had a significant, positive impact at national scale on researcher freedom to explore modes and structures of practice	2	7	1	0	6	16
Comments						0

There were no additional comments for this question

Research User: Question 15						
Knowledge sharing: Knowledge sharing has been explicitly supported through the facilitation of opportunities for social sharing and a commitment to the publication of reports, fact sheets and other publications in easily accessible language – e.g. through the appointment of dedicated knowledge brokers.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC estuaries research has had a significant, positive impact on COMMITMENT to knowledge sharing among research providers, research users, research funders and the wider community in South Africa	5	5	3	0	2	15
List fields in which knowledge sharing has been supported at national scale						8

Fields in which knowledge sharing has been supported at the national scale

1	This can only be seen in terms of perceptions - WRC would presumably have the hard data reflecting reports, publications etc. It would seem to make more sense to point to these & ask what people think of them.
2	Publication of the guideline documents on estuary management

3	This has been particularly in the field of general management of wetlands. In the project with which I am involved there will also be a contribution in terms of enterprise development sensitive to a wide3 suite of ecosystem services delivered by wetlands and potential risks facing the enterprise.
4	Freshwater field
5	I can't speak for others, but I regularly need to communicate with research providers and other research users when developing EMPs. The fact that WRC funded programmes are widely used by both these sectors facilitates communication and sharing.
6	I cannot give fields - but the provision of the Water Wheel and Water SA as well as the free provision of reports is important in sharing knowledge
7	Integrated catchment management Freshwater requirements of estuaries Estuarine ecology and management
8	Knowledge sharing is limited to the wider community of South Africa i.e. there was a WRC PROJECT regarding the profiling estuary management in IDP with particular reference to the eastern cape. Most of the municipal IDP does not have anything to do with estuary management- due to non communication at lower levels.

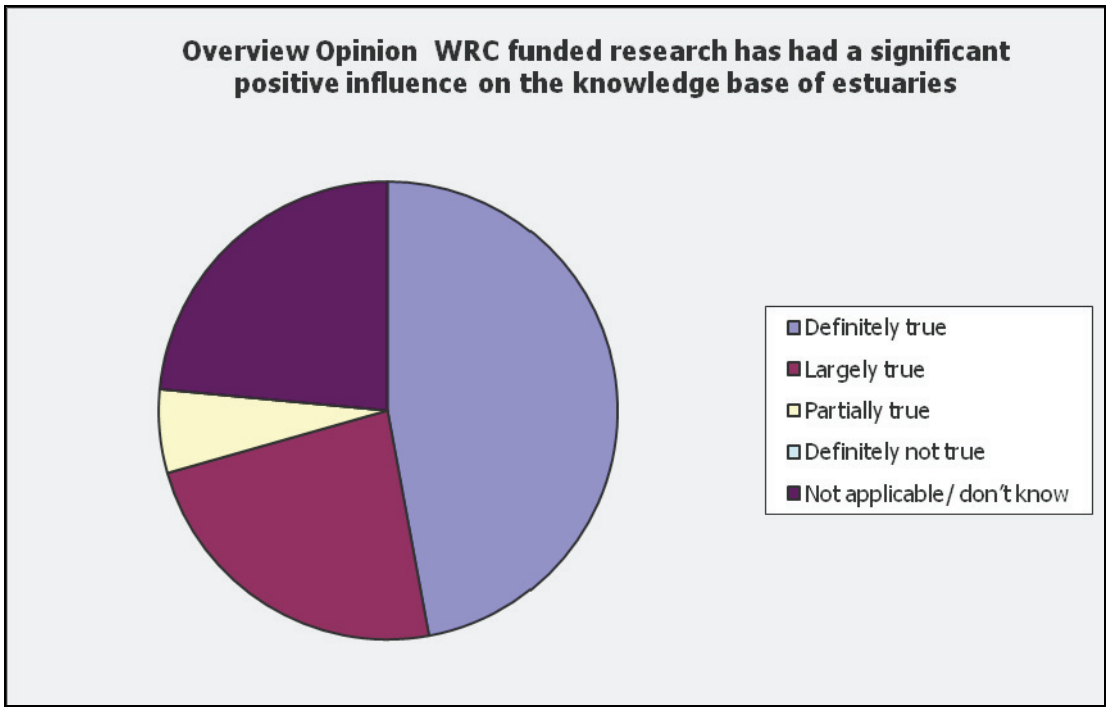
Research User: Question 16

Adaptive learning: Feedback from project evaluations and program assessments is being used to improve processes, relationships and behaviours.

Answer Options	Definitely true	Largely true	Partially true	Definitely not true	Not applicable/ don't know	Response Count
WRC funding for estuaries research has had a significant, positive impact on adaptive learning at national scale	2	5	0	0	9	16
List assessments and evaluations that have involved participation at national scale						2

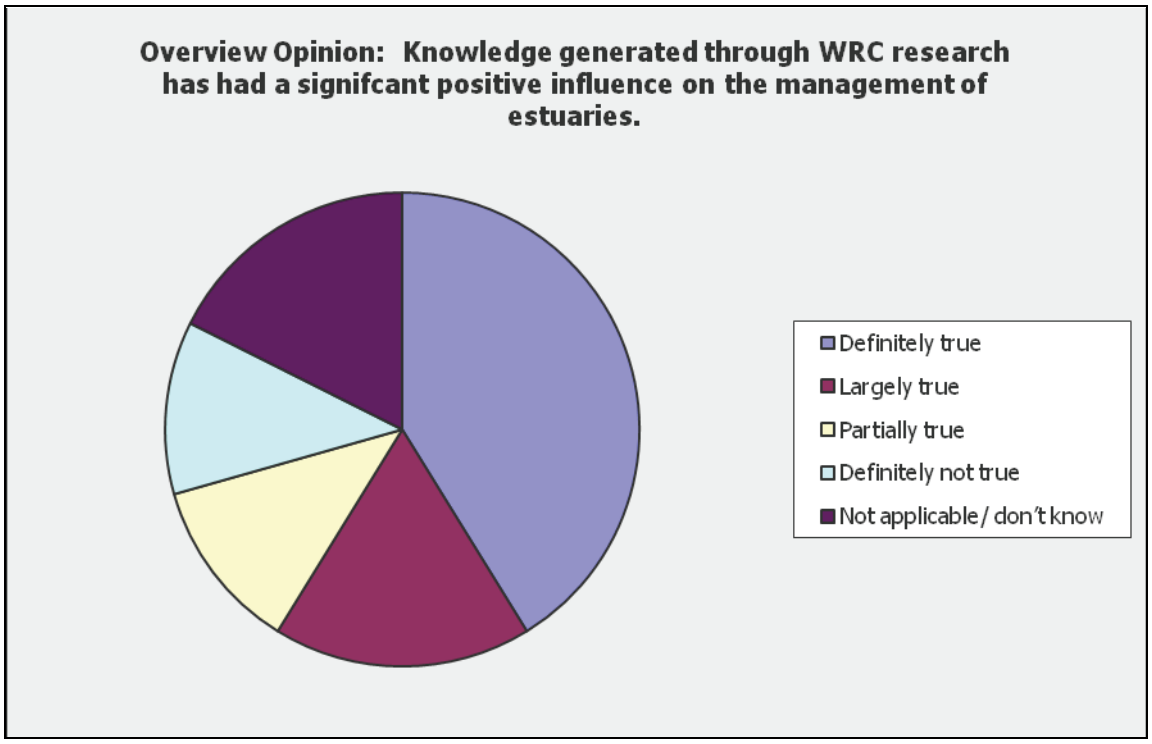
All research projects I have been involved in have included a cross section of government and non-government representatives including national, provincial and local.

Research User: Question 17



Examples and comments are presented below

1	Detailed understanding of the ecology of small estuaries Incorporation of economics into estuary management decision making The consideration of economic empowerment in estuary management
2	There are crucial management issues (flood mitigation and repair), set back lines, boat carrying capacity, effects of boats on habitat and species, effectiveness of closed areas for different species, effect of harvesting of species, interaction between fishers and conservation, aquaculture and fishers, mouth management policies, flow requirements, etc that need to be researched. These issues would get the support and probably funding from Government.
3	Most of the estuaries in KZN have been researched.
4	The number of WRC reports that I have used to inform EMPs that are being developed attests to this.
5	More research on the numerous smaller systems in KZN would definitely enhance the knowledge base.
6	Integrated catchment management Freshwater requirements of estuaries Estuarine ecology and management
7	The Eastern Cape estuaries research programme formed the bases of the C.A.P.E. Estuaries programme which has developed more than 20 estuary management plans.



Examples and comments are presented below

1	Our record of estuarine "management" is dismal in the extreme. There still seems to be the perception that we can "manage" estuaries which presumably means that we understand these systems in all their diversity, can presumptuously define an "ideal" and manage towards & recognize some sort of omega point. We definitely know how to mess up estuaries and have to accept that the only real management possible is the management and control of human activities which impinge on estuaries. "Management of estuaries" critically needs to bring out this reality.
2	The guideline documents on estuary management are an excellent resource
3	National Estuary Management Policy and Protocols
4	I have not been provided with any specific WRC products that have made a difference in the CAPE Estuaries Programme.
5	Recommendations in reports influence management objectives
6	Research needs to be more applied and management and issue focused
7	WRC funded research is usually focused and applicable to real-life scenarios, and as such can be used to inform management recommendations and/or decisions and increase capacity. Examples: WRC Report 756/1/03 (REI) and 1485/1/07 (Estuary Management for Local Government).
8	Mainly applying principles learnt from Cape systems to manage KZN estuaries. More work/surveys for KZN since Begg's work need to be done.
9	Integrated catchment management

	Freshwater requirements of estuaries Estuarine ecology and management
10	The Eastern Cape estuaries research programme formed the bases of the C.A.P.E. Estuaries programme which has developed more than 20 estuary management plans

Research User: Question 19

The following indicators have been used to structure this questionnaire. Please indicate their relative importance for you by ranking them, with 1 BEING THE MOST IMPORTANT to 10 being the LEAST IMPORTANT.

Answer Options	1	2	3	4	5	6	7	8	9	10	Response Count
Research excellence	6	2	0	1	2	0	0	1	2	0	14
Discourse	0	1	2	0	2	0	2	0	3	3	13
Knowledge sharing	3	4	4	2	0	0	0	0	2	0	15
Communication	0	1	2	3	3	3	0	2	0	0	14
Relevance	3	4	1	2	2	0	0	1	0	1	14
Social/economic well-being	1	0	3	1	1	2	0	3	1	2	14
Capacity	2	2	0	2	2	3	2	1	0	0	14
Continuity	0	0	1	0	0	3	2	5	1	1	13
Leadership	0	0	1	3	1	3	2	1	1	2	14
Flexibility	0	0	0	0	1	0	5	0	4	4	14

No additional comments were provided for this question.

Research Funders

Research Funder : Question 1						
Strategic planning: A clear case has been articulated for WRC funded research that:						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
Aligns with priorities relevant to MY INSTITUTION	1	1	0	0	0	2
Aligns with NATIONAL PRIORITIES	1	1	0	0	0	2
List the national priorities that have been aligned with research						2

Comments provided by funders are presented below

1	I see that 'national' and 'government' priorities are not the same - the following is for estuaries 1. Environmental flows for estuaries 2. Sustainable livelihoods and recreational experience from estuaries 3. Estuary management in terms of the policies and legislation of DEAT
2	1.Biodiversity protection 2.System functioning 3.Pollution reduction

Research Funder : Question 2						
Leadership: leadership has been established, aspirational and dynamic program goals developed, and a suite of research projects identified. WRC funded estuaries research has						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
Had a significant, positive impact on MY ABILITY to provide leadership	1	1	0	0	0	2
Provided leadership at the NATIONAL SCALE	1	0	0	0	1	2
Comments						1

Leadership provided by the research community has enabled DWAF to incorporate the concept of environmental flows into policy/legislation

Leadership provided by the research community has enabled DEAT to include science-based estuary management into policy/legislation.

Research Funder : Question 3						
Scientific capacity: Funds have been allocated for mentoring, advancement of facilities, inter-project learning, and creative opportunities to advance disciplinary, interdisciplinary and trans-disciplinary science. WRC funded research has had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
MY ABILITY to promote transdisciplinary science	1	1	0	0	0	2
Transdisciplinary scientific capacity in SOUTH AFRICA	0	1	1	0	0	2

There were no additional comments for this question

Research Funder : Question 4						
Flexibility: Research projects and teams have freedom to explore modes and structures of practice within appropriate limits of scientific and financial accountability.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC estuaries research has the flexibility I REQUIRE to explore modes and structures of practice	1	1	0	0	0	2
The flexibility of WRC funded research has had a significant, positive impact at NATIONAL SCALE on researcher freedom to explore modes and structures of practice	1	1	0	0	0	2

There were no additional comments for this question

Research Funder : Question 5		
Knowledge sharing: Knowledge sharing has been explicitly supported through the facilitation of opportunities for social sharing and a commitment to the publication of reports, fact sheets and other publications in easily accessible language – e.g. through the appointment of dedicated knowledge brokers. WRC estuaries research has had a significant, positive impact on MY COMMITMENT to knowledge sharing.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	50.0%	1
Largely true	50.0%	1
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	0.0%	0
List fields in which you have explicitly supported knowledge sharing		2

Fields in which knowledge sharing has been supported

1	1.Estuary research 2.River research 3.Black fly control 4.aquatic toxicology 5.in fact, my way of working
2	1.Macro invertebrates 2.Aquatic vegetation 3.Benthos 4.Water quality

Research Funder : Question 6		
Knowledge sharing: WRC estuaries research has had a significant, positive impact on commitment to knowledge sharing among research providers, research users, research funders and the wider community in South Africa.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	0.0%	0
Largely true	100.0%	2
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	0.0%	0
List fields in which knowledge sharing has been supported at national scale		1

Environmental water requirements; livelihoods from ecosystems (estuaries and wetlands); ecosystem rehabilitation; Ecosystem health; black fly control; Shared rivers

Research Funder : Question 7		
Continuity: Funding and consistent leadership has been established that is conducive to long-term research. WRC estuaries research has enabled ME TO PROVIDE the continuity required for long-term research		
Answer Options	**Response Percent**	**Response Count**
Definitely true	50.0%	1
Largely true	0.0%	0
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	50.0%	1
List your long term research programs and their duration		1

Long term research programs listed below

1	Consistent funding has, in my view, been one of the important factors in the long-term relationship between researchers and the WRC, and has enabled the South African water sector to be numbered amongst the world leaders Environmental water requirements - 1987 - ongoing Black fly management - 1988 - 2008 (4 * 3 year projects, - not consecutive) KNPRRP - 1988 - 1999 East Cape estuaries Research programme - 1997 - ongoing River Health Programme - 1994 - ongoing but scaled down Wetland research - 2004 - ongoing impoundment management - 2005 - ongoing Endocrine disrupting compounds - together with other WRC colleagues - several projects

Research Funder : Question 8						
Continuity: End users maintain commitment and engagement to WRC funded estuary research.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on INSTITUTIONAL COMMITMENT to estuary research	0	2	0	0	0	2
List institutions that have shown commitment						2

Institutions that have shown commitment to estuary research are presented below

1	DEAT DWAF Durban and Buffalo City Municipalities CAPE Programme
2	Oceanographic Research Institute CSIR Cruz (Coastal Research Unit in Zululand)

Research Funder : Question 9		
WRC estuaries research has had a significant, positive impact on long-term research in South Africa.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	0.0%	0
Largely true	100.0%	2
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	0.0%	0
List national long term estuary research programs of which you are aware		2

Long term estuary research programs presented below

1	In addition to WRC programmes, and including management programmes CAPE programme
2	Nhlabane Estuary Research Programme

Research Funder : Question 10		
Adaptive learning: Feedback from project evaluations and program assessments is being used to improve processes, relationships and behaviours. WRC funded estuaries research is assessed and evaluated to improve adaptive learning		
Answer Options	**Response Percent**	**Response Count**
Definitely true	50.0%	1
Largely true	0.0%	0
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	50.0%	1
List assessments and evaluations that YOU have supported		1

The River Health Program Evaluation was the only example provided

Research Funder : Question 11		
WRC funding for estuaries research has had a significant, positive impact on adaptive learning at the national scale.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	0.0%	0
Largely true	50.0%	1
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	50.0%	1
List assessments and evaluations that have involved participation at national scale		1

Research Funder : Question 12		
WRC estuaries research has a program of events relevant to MY INSTITUTION that sustain discourse among research providers, research users and the wider community.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	50.0%	1
Largely true	0.0%	0
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	50.0%	1
List recent events relevant to YOUR institution		1

Research Funder : Question 13		
WRC funding for estuaries research has a program of events that sustain relevant discourse at national scale among research providers, research users and the wider community.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	0.0%	0
Largely true	50.0%	1
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	50.0%	1
List recent events that have had national participation		1

CERM was the only example provided

Research Funder : Question 14		
Co-funding Has your organisation co-funded research studies with WRC?		
Answer Options	**Response Percent**	**Response Count**
Yes	100.0%	1
No	0.0%	0

Research Funder : Question 15						
Social and economic well-being: effects on subsistence fishing communities, commercial fishers, aquaculture farmers, recreationists, tourists, harbour operators benefit. WRC funding for estuaries research has enabled...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
ME to use research to influence the well-being of resource users	0	2	0	0	0	2
SOUTH AFRICAN RESEARCH FUNDERS to influence the well-being of resource users	0	1	0	0	1	2
Provide examples						2

DEAT management of estuaries was the only example provided.

Research Funder : Question 16						
WRC funding for estuaries research had a significant, positive impact on...						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
The wider acknowledgement/ attainment of research excellence in South Africa	0	2	0	0	0	2
The global body of scientific knowledge	0	2	0	0	0	2
Wider perceptions of professionalism in research	0	2	0	0	0	2
Research funders sharing knowledge with research providers	1	1	0	0	0	2
Research funders sharing knowledge with research users	1	1	0	0	0	2
Research funders sharing knowledge with research funders	0	2	0	0	0	2
The relevance of research for South Africa	1	1	0	0	0	2
The relevance of research outside of South Africa	1	1	0	0	0	2
Capacity building in South/southern Africa	0	1	1	0	0	2
Capacity building further afield	0	0	2	0	0	2
Opportunities for research findings to be communicated with society	0	0	2	0	0	2
Please provide comments or examples wherever possible						1

Research programmes provide opportunities for communication to a wider audience than the scientific community.

Research Funder : Question 17						
Discourse: Staff from end user organizations and community members dedicate time to make meaningful contributions to the strategic direction of WRC funded estuary research.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the strategic direction of research in South Africa	1	1	0	0	0	2
List any strategic directions that have been influenced						2

Strategic directions are listed below

1	Input from municipalities, national and provincial government, 1. capacity building in estuary management/livelihoods 2. environmental water requirements of estuaries 3. socio-economic analyses of estuary use and development
2	National State of the Environment Reports

Research Funder : Question 18						
Capacity for adoption: End user partners ensure they have in-house capacity to engage in the research process and to absorb and utilize relevant new knowledge.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the development of INSTITUTIONAL CAPACITY	0	2	0	0	0	2
List institutions and benefits						2

1	only in the larger organisations where a degree of capacity already exists
2	Oceanographic Research Institute CSIR Cruz (Coastal Research Unit in Zululand)

Research Funder : Question 19						
Organizational research capacity: Research users support the capacity and availability of their staff to engage with the external research community.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the availability of RESEARCH FUNDERS to build in-house scientific capacity to effectively engage with the external research community	0	2	0	0	0	2
List research users that are available to host researchers						2

1	Where capacity already exist this holds true, and in some cases has led staff to register for higher degrees in estuary management/science
2	Oceanographic Research Institute CSIR Cruz (Coastal Research Unit in Zululand)

Research Funder : Question 20						
Adaptive decision-making and policy revision: End users have the processes and flexibility to incorporate new research findings into their decision-making, strategic planning and policy where relevant.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the incorporation of research into decision-making, strategic planning and policy	0	1	1	0	0	2
List key areas of influence						2

Environmental management plans and company policies

Research Funder : Question 21						
Co-location: End users are prepared to host post-graduate students and research staff to enable them to conduct their research in real-world contexts.						
Answer Options	**Definitely true**	**Largely true**	**Partially true**	**Definitely not true**	**Not applicable/ don't know**	**Response Count**
WRC funding for estuaries research has had a significant, positive impact on the willingness of research user institutions to employ qualified research personnel	0	2	0	0	0	2
List the institutions you know of that have hosted researchers						0

Research Funder : Question 22		
Overview Opinion WRC funded research has had a significant positive influence on the knowledge base of estuaries		
Answer Options	**Response Percent**	**Response Count**
Definitely true	50.0%	1
Largely true	50.0%	1
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/don't know	0.0%	0
Examples and comments		1

The East Cape Estuaries Programme and the environmental water requirement programme are probably the best examples of this.

Research Funder : Question 23		
Overview Opinion: Knowledge generated through WRC research has had a significant positive influence on the management of estuaries.		
Answer Options	**Response Percent**	**Response Count**
Definitely true	50.0%	1
Largely true	50.0%	1
Partially true	0.0%	0
Definitely not true	0.0%	0
Not applicable/ don't know	0.0%	0

Research Funder : Question 24

The following indicators have been used to structure this questionnaire. Please indicate their relative importance for you by ranking them, with 1 BEING THE MOST IMPORTANT to 10 being the LEAST IMPORTANT.

Answer Options	1	2	3	4	5	6	7	8	9	10	Response Count
Research excellence	2	0	0	0	0	0	0	0	0	0	2
Discourse	0	0	0	0	1	0	0	0	1	0	2
Knowledge sharing	0	0	1	0	0	0	0	1	0	0	2
Communication	0	0	0	0	0	0	1	0	0	0	1
Relevance	0	0	1	0	0	1	0	0	0	0	2
Social/economic well-being	0	0	0	0	0	0	0	0	0	2	2
Capacity	0	0	0	1	0	1	0	0	0	0	2
Continuity	0	1	0	0	0	0	0	1	0	0	2
Leadership	0	0	0	1	0	0	1	0	0	0	2
Flexibility	0	0	0	0	1	0	0	0	1	0	2